British Society for the Study of Orthodontics.
1930

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TRANSACTIONS

OF THE

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1930

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British Society for the Study of Orthodontics.

An ordinary meeting of the Society was held on Monday, January 20th, 1930, Mr. H. E. Marsh, President, in the chair.

The minutes of the previous meeting were signed as correct, and four newly elected members signed the obligation book and were welcomed by the President.

The following candidates were unanimously elected members of the Society: Ernest A. Hardy, L.D.S., M.R.C.S.Eng., L.R.C.P.Lond., 79, Harley Street, W.1; Harold Tattersall, L.D.S., 445, Finchley Road, N.W.3.

The President read his inaugural address on "Orthodontics in General Practice," which was illustrated by lantern views and models.

ORTHODONTICS IN GENERAL PRACTICE.

By H. E. Marsh, M.C., L.D.S.

My distinguished predecessor, in a presidential address, stated that an occasion such as this should be made an opportunity to contribute something, however small, to scientific knowledge, and if you refer to the *Transactions* of the Society you will find that in the majority of cases this excellent ideal has been fully maintained by those who have had the honour to preside over it.

Would that it were given to me to follow in their footsteps; but I am not without hope that the title I have chosen for this address may be sufficiently embracing to permit me to use it fairly as a means of giving expression to my views on some problems in orthodontics, and an account of a few cases, some of which have been unsuccessfully treated, but from which there are, perhaps, lessons to be learned.

The steady increase in the membership of the Society is not to be wondered at—the study of the problems of orthodontics is never-ending, and regular attendance at the meetings (which, I suppose, is the reason that I find myself in this chair) for the past twenty years has served as a never-failing mental stimulus, and I recommend it to all those, if there be any, who may consider the ordinary practice of dental surgery to be in any way monotonous and insufficient in scope for their powers.

There are some who say, "I do not do orthodontic cases, they demand so much time, so much skill and the possibilities of failure are so great that I cannot pretend to deal with them adequtaely, and I refer them to a specialist." Such men are at any rate honest, but the number of specialists available in this country is so small, and the demand for treatment of oral deformity so great, that it is certain that the practice of orthodontics must continue to take an increasingly large place in the daily work of the ordinary dental practitioner whom I represent.

If it be true that all, or nearly all, cases of malocclusion of the permanent dentition arise from causes which have been in operation from a very early age, and which a close study of the deciduous dentition would have foreshadowed, then the paramount importance of early diagnosis and the warning of parents of future possibilities, if not the institution of corrective treatment, must be emphasised.

Rightly we may hesitate to interfere with natural processes of growth at, say, age $4\frac{1}{2}$ to 6, but I have had reason, frequently, to regret that I did not do so, when a threatened post-normal occlusion has developed and proved highly intractable in after years.

The use at such ages of a lingual arch in the maxilla with auxiliary springs to move (buccally) deciduous canines will sometimes allow the mandible to come forward into correct occlusion, whereas, left untreated, the interlocking of the cusps of the first permanent molars

will become post-normal and the lower incisors will over-erupt into a vicious overbite and later results will be as shown.

If there is marked under-development in the size of the deciduous arches, with crowding of the incisors instead of spacing, it may be advisable to use appliances to widen the arches in an effort to stimulate growth of the bones. But it should not, perhaps, be undertaken until after the eruption of the tips of the lower central incisor teeth, whose size will give a valuable clue, in the consideration of the problem of whether such expansion treatment is necesasry or not.

There are some cases where the canine overbite is but slight, where the same beneficial improvement in the establishment of correct occlusion may be obtained without the use of an appliance at all, by judicious grinding of the occluding surfaces of the upper and lower deciduous canines, so permitting the mandibular teeth as a whole to come into a more forward occluding position.

In my view, removable plates are better for this purpose than fixed appliances, if the child of 7 or 8 can be induced to wear them. At that age, it will often be found that the child is less sensitive and that plates can be tolerated better than at age 10 or 11 ; advantage can be taken of the shape of the necks of the deciduous molars to get a good grip for the plate, whereas the deciduous molars may be loosening or have been shed at the later age.

It seems to me, too, that for general stimulation of bone growth, the pressure is distributed over a larger area than that obtained through fixed appliances. But, of course, many children will not tolerate plates at all, and fixed appliances, if fitted with a minimum of pain, or should I say discomfort, they will put up with without demur. Much more of the operator's time will be consumed, however. Bands must be so fitted that they will not come off unless removed by an instrument. Lingual arches must have locks whose rods and tubes fit really tightly so that the arches do not rock up and down. If auxiliary springs are used, they must not be deprived of their tensile qualities by overheating of their soldered attachments, and the amount of force to be given when the springs are opened must be carefully judged, a little being much more effective than a lot. If lingual arches are to be used without auxiliary springs, but are to be made with loops in the arch itself, one anteriorly and one on each side, the bends, to be given in opening the loops, are to be made with the greatest caution and frequent tests with one lock engaged and one lock disengaged, must be made, in order to see that pressure will in fact be made in the desired direction. If the operator cannot or will not take the necessary trouble to ensure the foregoing, it were better that he abandoned the use of the lingual arch entirely for its possibilities of harm, if incorrectly used, will soon become evident. Rotation and tipping of anchor teeth, cusps of lower molars moved into buccal or lingual occlusion from normal, can easily take place, but are much less easily corrected again.

If used with care, however, it is an appliance of great value, for it takes up a minimum of room in the mouth ; the force it delivers is ideal in that it is gentle yet continuous and therefore needs infrequent adjustment. Such an appliance is just what is wanted for British children, so many of whom are away from their dentists at boarding school. It can be fitted in the holidays and the patient can be seen and the readjustments made at half-term, but it must be properly fitted and adjusted in the first place.

It has been said that the lingual arch appliance is limited in its action in that it is not capable of producing root movements in the

horizontal plane except in the case of anchor teeth. Root movements in the vertical plane, such as depression of lower incisors and the further eruption of teeth by pulling upon them with auxiliary springs, can, of course, be produced, but some complain that bodily movement of teeth in the horizontal plane cannot be effected with this appliance.

For general practitioners as opposed to specialists, I believe that the more that bodily movements of teeth can be avoided the better.

Twenty-five years ago I was taught as a student by a distinguished former President of this Society, Mr. Hopson, that I should find with experience in treatment that the simplest way of accomplishing an object would generally be found to be the best. No one can have watched the development of the appliances designed by Angle, the most recent of which he designates "the latest and best in orthodontic mechanism,"* without the most profound feeling of admiration for his ingenuity, but I say frankly that here we have a system of appliances which may be capable of producing the results which he claims if correctly used, but which, at the same time, seem to me to be to some extent out of accord with the principle of orthodontic treatment that our appliances should be instruments to assist natural development of growing tissues, or to impede developing deformities, rather than engines of great force, however much controlled, which either translate teeth bodily and in large numbers from position A to position B, as it were, or else lock them immobile in the grip of a bracket band.

That appliances and force are required at all to move teeth into positions of balanced occlusion and beautiful alignment is objectionable, and the less deep-seated the mechanical stimulus to growing tissues, the more likely we are to avoid possible serious damage to periodontal membranes and uncompleted root apices. In this connection the findings of Ketcham, in his paper on "Apical root Resorption of Permanent Teeth"† given at the 1926 International Orthodontic Congress, were that radiograms showed apical root resorption in treated cases in the proportion of roughly one in four, where root-moving appliances had been used, as compared with roughly one in a hundred where appliances of the non-root-moving type were used.

These facts are of the greatest significance and give support to the view, now becoming more and more widely believed in, that treatment, to be of permanent value, must do no more than facilitate the assumption, by the teeth and associated tissues of harmonious and balanced relationships wherein natural development will continue and growth take place with a minimum of interference. Otherwise a greater or lesser degree of relapse will surely ensue.

I feel that of our appliances, such as plates, arches, etc. (as opposed to lip exercisers and the like), which are put into the mouth to be "worn," act not only as we wish them to do, that is, as accelerators of growth, but also as retarders, in that, even if the force of reaction which is the counterpart of every force of action which we institute, can be arranged for in a desired rather than an undesired direction, there is still the unavoidable interference with the action of the muscles of the tongue, lips and cheeks to be reckoned with.

Reports by eminent specialists, the ability of some of whom is probably unexcelled, upon cases of relapse, which has supervened at age eighteen or twenty, four or five years after the relinquishment of

* Angle, E. H., "The Latest and Best in Orthodontic Mechanism." *Dental Cosmos,* December, 1928.

† Ketcham, A. H., "A Preliminary Report of an Investigation of Apical Root Resorption of Permanent Teeth." *Proceedings,* 1st International Orthodontic Congress, 1926.

appliances, should serve as a warning to the general practitioner that to aim at a limited but permanent result may be best for his patient in the end.

The place of extraction in the predetermination of treatment should not be excluded, but always be regarded as a possible necessity—the upper second molars, in post-normal occlusion cases at the end of treatment, perhaps, or the first premolars in neutrocclusion cases at the beginning or even the first molars where carious or badly calcified.

We know that in many cases the malformed arch is an inherited characteristic, and we have had much evidence that such cases, even after lengthy retention of balanced occlusion and correct alignment, tend to relapse, perhaps only partially but sufficiently to cause great disappointment at least to the dentist, if not to the parents and patient.

In my opinion a careful estimation of the size of the apical base, as compared to the size of the teeth and a consideration of the contours of the outer alveolar surfaces at the apical, as compared to the cervical level, will assist in the prediction of whether in the end relapse is likely or not, to ensue.

It is, of course, impossible to foretell the degree of interstitial bone growth in the apical region that may be going to take place during the next five years, in the case, say, of a child of the age of 10 years, but we do know that relapse will certainly take place unless growth of the apical base accompanies or follows the movements of the crowns of teeth which we produce by means of appliances, so establishing adequate natural support when extraneous mechanical support has been discarded.

I think that the question of extractions should depend not so much upon whether pleasing alignment and good occlusion can be gained after mechanical enlargement of the arches to accommodate the crowns of the teeth, but upon whether the disparity between the development of the bony framework about the roots and the size of the teeth to be contained therein demands the sacrifice of two or more teeth in order that, literally, there may be "enough bone to go round."

This is an extremely difficult decision to make. The general bony development of the patient may be no guide whatever, for lack of growth of the apical base is to be found in children and adolescents whose bone development is otherwise excellent.

Rotations may take place in the crypts before eruption. Cases of rotation are to be seen where alveolar arches are of a size more than adequate to accommodate the whole of the teeth, and where there is a space between the rotated tooth and the next tooth in front or behind or both. Yet in treating cases of rotation in crowded arches, do we not know how they relapse unless there is adequate interstitial growth about the roots of the teeth ?

With your permission, I will show slides of cases from practice which will serve to illustrate some of the foregoing observations ; others may be of interest as in some cases they were not brought to a successful conclusion, and I shall try to point out the reasons for this.

Fig. 1 shows a case of Angle, Class I, at age $7\frac{1}{2}$, where the upper right central incisor has erupted in lingual occlusion and the upper left central edge to edge. They are both rotated.

By the use of a maxillary lingual arch and auxiliary springs, first the centrals and later the laterals, which also erupted lingually, were moved forward to labial occlusion.

My experience of malocclusions of the Angle, Class I type is that they nearly always occur in cases where there is early eruption of the permanent teeth, before there is sufficient growth of bone,

Fig. 1.

particularly in the canine region, to accommodate the teeth. This is, however, as I observed earlier in this paper, by no means always the case.

Fig. 2 shows a so-called mutilated case where the lower first molars were extracted and a plate used which capped the cheek teeth and included a half-round wire extending from one of the vulcanite capping flanges to push back the outstanding central incisors. The teeth are very large, and the appearance was very unsightly at age 15, when first seen.

Fig. 2.

The capping plate was discarded and a Badcock plate with inclined plane substituted, having a labial arch with two loops for the central and no capping of the cheek teeth. The result after three months is as shown, and a similar plate without the screw has been used as a retainer for a year and is now being worn at night only. I think there may be relapse in this case if the plate is discarded, and I have gone so far as to advise the patient to wear the plate as a retainer at nights only, until she is 20, owing to the unbalanced bite, which the eruption and occlusion of the third molars will, I hope, do something to stabilise.

Fig. 3 shows a case of Angle, Class II, Division 1, which responded to treatment with fixed appliances rapidly and which was treated just before the eruption of the permanent canines.

The case has maintained itself without retainers for the past three years, and there has been considerable growth of bone about the roots of the anterior teeth. Intermaxillary traction was used, and the only correction of the overbite was a lower lingual arch to push the

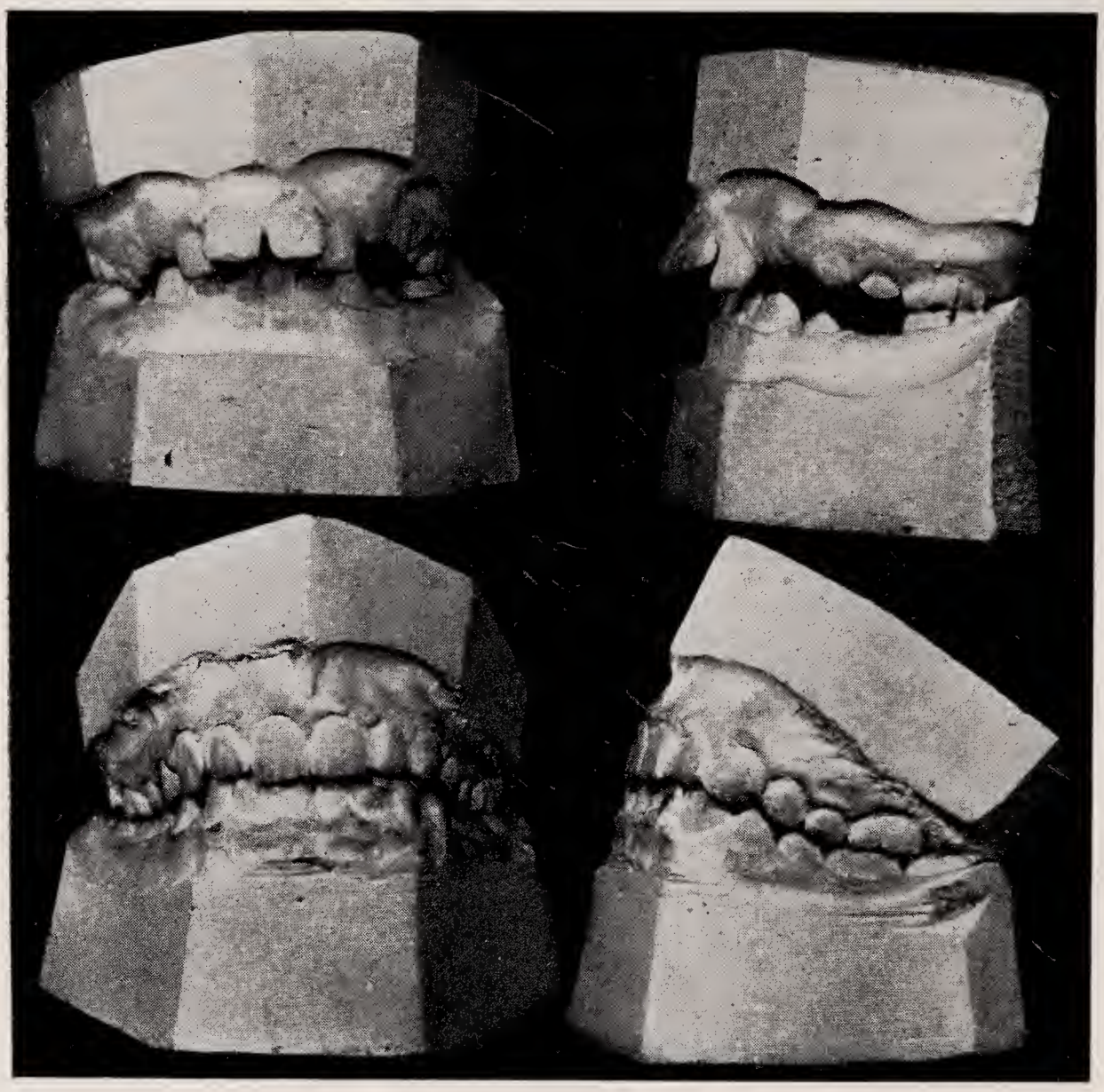


Fig. 3.

lower incisors forward, and without auxiliary springs to depress them.

Fig. 4 shows a case of Angle, Class I, with an impacted second deciduous molar.

The upper right central is rotated and protruding. The upper right first molar was extracted and the deciduous molar also. The second premolar erupted and the second molar came forward; the central incisor was brought into alignment.

The next was one case of Angle, Class II. The upper jaw and teeth

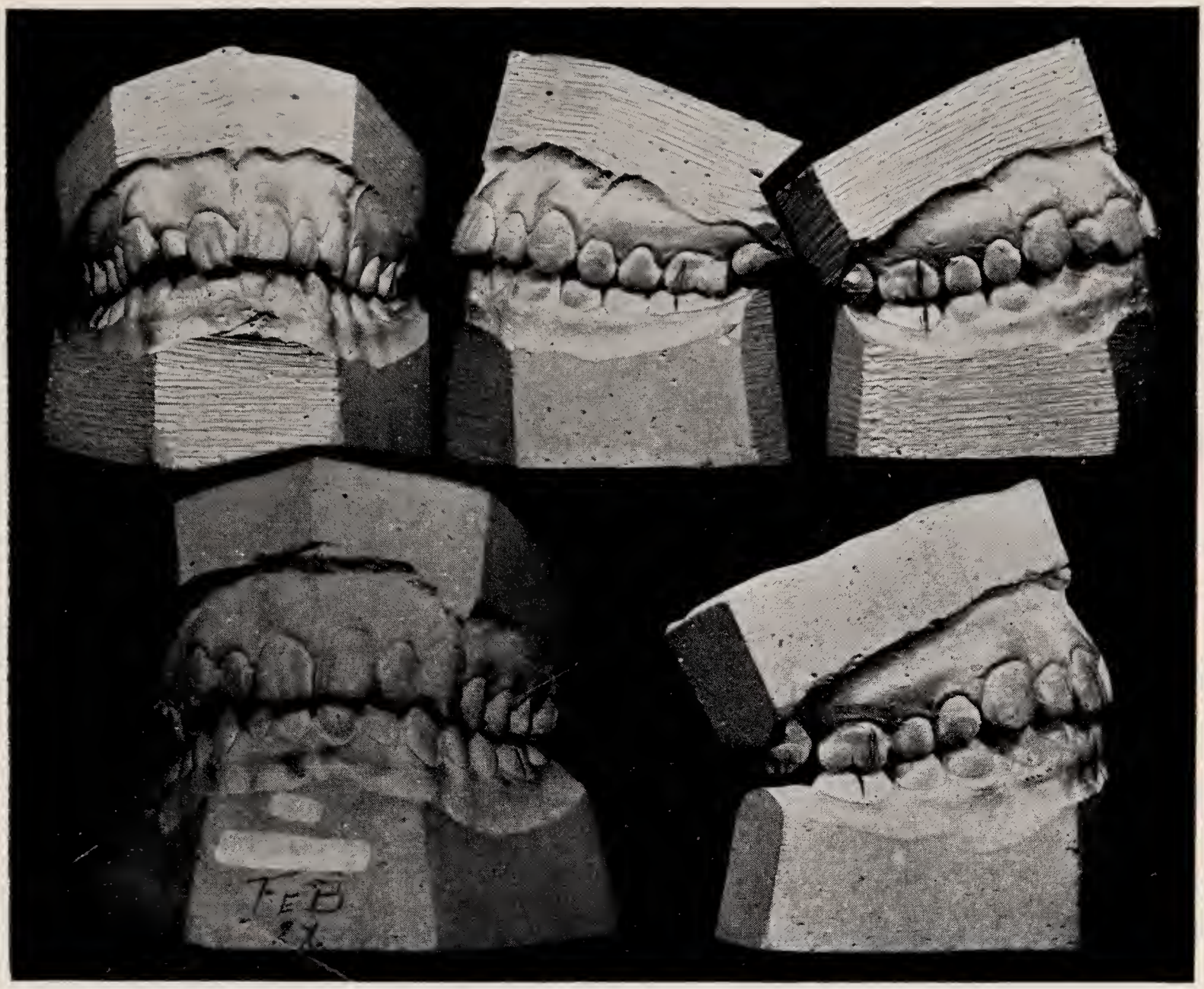


Fig. 4.

are large. The lower jaw is very small. There is a marked lack of vertical growth in the mandible. The lower premolars all bite inside the upper premolars except the left second. The second models show the result of a year's treatment. The probability of relapse is very great indeed. If the extraction of premolars were carried out, I believe the upper canines would fall in behind the laterals and the condition be worse than if this were not done. Whether extraction of the upper second molars at the stage shown in the second models would be likely to be beneficial is a moot point. I am inclined to think that it would, by diminishing the tendency for the mandible to be locked back and by diminishing the tendency to further forward translation of the maxillary teeth when the third molars erupt.

The next case was one of Angle, Class I; the lower right first molar was lost at age 10, the first models were taken at age 12.

There is rotation of the upper right lateral incisor and overlapping of upper and lower incisors. A year's treatment with fixed appliances produced the conditions shown in the second models. There has been considerable growth of bone about the roots of the teeth. I think there is a fair prospect of non-relapse. A plate is being worn at night only.

The next case was one of a very marked post-normal occlusion, and superior protrusion. I did not hesitate to extract the first premolars. It is still under treatment. I show it merely as an example of a case where extraction is definitely demanded and where treatment without extraction is likely to be of no avail.

The patient is 15 years old. Intermaxillary traction, a maxillary labial arch and a mandibular lingual arch to move the lower incisors forward are doing their work well.

The next case illustrates the value of symmetrical extraction in Angle, Class I, cases, as opposed to the extraction of two upper teeth only.

The first models illustrate the original condition. I concluded that room could be gained for the lower canines by the extra space available after the shedding of the deciduous lower second molars. The result seen in the second models shows that the extraction of the lower first premolars as well as the uppers would have been correct. As it is, the incisor teeth are edge to edge. There was normal overbite in the first models.

Of the last case I am unable to show models, only radiograms. This patient had a supernumerary deciduous incisor geminated with the deciduous right upper central incisor. All the other deciduous teeth are present.

At age 11, he had not cut his permanent right upper central incisor. X-ray examination showed what you see in the first slide.

An exploratory operation revealed the presence of a supernumerary tooth lying horizontally in the bone, its crown preventing the eruption of the right central. It was removed. An appliance should have been used to keep the space—this was not done. The boy's home was two hundred miles away ; the dentist there did not co-operate.

Seen again at age 13, the central had come down farther, but was not through the gum. The lateral had partially closed the space. The lateral was extracted. The central is now fully erupted at age 15 and there is very little space between it and the canine.

This boy was subject from age 8 to 11 to unpleasant nervous habits ; of shaking his head and twitching his face. His colour was bad and his strength below normal. After extraction of the supernumerary tooth, all this had cleared up. His skin changed from a dirty yellow to that of a healthy youngster. He astonished his parents by winning an entrance scholarship to a public school.

During my year of office the Society will receive short communications and papers from its members and others, which will be contributions to scientific knowledge, so maintaining a tradition for which it has attained some fame.

I have been able to give you only some examples, exemplified in these few cases, of the practical application of the lessons I have learnt here. After twenty-five years of general practice, I would say to the younger members—in the treatment of your cases, try to predetermine the result of your proposed corrective measures, try to ensure that your apparatus when made and applied will do in fact what it was designed to do, and above all, avoid the infliction upon little children of appliances which may not only accomplish nothing beneficial, but may be actually harmful, by impeding muscular activity and delaying the natural processes of growth.

In conclusion, I would beg of you not to neglect the taking of models for record purposes before, during, and at the end of your treatments. In a busy general practice it is not always easy to make time for this. But if you do not do so, you may find yourself unwilling to communicate to the Society some valuable contribution to orthodontic knowledge for lack of the models which would illustrate and prove your argument, thereby depriving the Society of its due, and yourself of much pleasure.

Mr. George Northcroft proposed a hearty vote of thanks to the President for the very able address he had delivered. It had been listened to with a great deal of pleasure, and the President had marshalled so many facts for the consideration of the members that it would be extremely useful to see this paper in print so that it could be considered still further. He added to the vote of thanks an expression of good wishes for a very successful year of office. He hoped that Mr. Marsh would enjoy his presidency as much as, he was sure, the members would do under his guidance.

Mr. Carl Schelling seconded the vote of thanks, endorsing all that Mr. Northcroft had said, and calling upon the meeting to pass the resolution in the usual manner.

The vote of thanks was carried unanimously and with acclamation, and the meeting terminated.

A CASE OF NORMAL DEVELOPMENT.*

By A. M. Davie, L.D.S.

Mr. Davie said the title of his Communication described correctly the case he desired to bring under the notice of the Society that evening, since no treatment whatever was given to it other than the wearing of elastic bands at night to approximate the two upper central incisors. He advised it merely because the mother did not like the space, but he would not describe it as treatment. The child in question was now 12½ years of age. The illustrations shown were from three sets of models taken at different ages and from one set of models of the mother's mouth, together with one photograph of three generations—the maternal grandmother, the mother and the child showing the facial types.

Fig. 1.—This shows the first set of models taken in April, 1924, when the child was 6 years and 8 months old. Lower incisors crowded, and arch somewhat constricted laterally with posterior teeth inclined lingually. The maxillary arch seems narrow at $\underline{c \mid c}$ and $\underline{1 \mid 1}$ are spaced. Comparison with the mother's arches caused foreboding (in view of present-day diet) and it was difficult to know what treatment to adopt.

The lower incisors were in quite normal relationship with the upper incisors, but the upper centrals were spaced and the lower incisors were definitely irregular.

The illustration shows the occlusal surfaces of the teeth. The lower incisors irregular, and the lower arch constricted. The upper arch also appears narrow in the canine region and the incisors spaced.

The author was uncertain what to do. Looking on the darker side of things from an elementary knowledge of orthodontics, he thought the irregularity was almost certain to grow worse; therefore he sent the models to Mr. Chapman for an opinion. Mr. Chapman replied saying it would be wise to wait and watch for development.

Fig. 2.—The second set of models was taken in December, 1925, a year and eight months later. Both arches have improved and lower incisors are definitely less irregular (adenoids were removed at this date, and tonsils two years later, December, 1927).

The illustration shows the teeth in very much better alignment and the upper centrals approximated a little. (At this time the child was wearing the small elastic bands.) The lower incisors have improved and the arches are nearly normal.

* *Transactions* of the Society, February 3rd, 1930.

Fig. 3.—The last set of models was taken in September, 1929, nine months later, the child being then 12 years of age. The illustration shows the occlusion and the arches normal. The maxilla and mandible are in harmony with the rest of the face. The overbite, however, is not quite normal.

He regretted that no models were taken of the temporary dentition. There was no mouth-breathing. The child was artificially fed, and later had ordinary diet with a fair proportion of crusts and hard food. As there was only one child, there were no other models for comparison.

Fig. 4.—This shows models of the mother's mouth, taken some time previously. The six-year molars are in correct mesio-distal relationship. Occlusion is normal, with irregularity of lower incisors. In the maxilla the arch is narrow anteriorally. In actual life this latter is quite imperceptible owing to the facial contour corresponding to the arches. The lower incisors are irregular as in the case of the daughter, and the upper arch rather constricted in the canine region.

Fig. 5 shows the models of the child and one of the mother. The improvement which has taken place is clear, when the first, second and third set of the child's models are examined. He thought it would be agreed that both arches are now quite well arranged.

Fig. 6 shows photographs of the faces of the three generations. The occlusion in the case of the child seems to be almost ideal; the maxilla and mandible are in harmony with the rest of the face. The mother's arches, it would be recollected, were rather narrow, and it would be seen that the face looked somewhat constricted laterally. The position in the photograph was a very good one from his point of view, because the patient was looking down, giving a view of the prominent chin and constricted arches. The position of the grandmother was not so fortunate, for the photograph shows her face in a rather different aspect from that of the mother; they are, however, extraordinarily like each other, with the same type of face; the apparent difference is due to the photograph.

The maternal grandmother says she had very good teeth until 60 years of age. They were then extracted by her doctor's advice. Unfortunately there are no models.

Unfortunately there are no models available of the father's teeth, his teeth being lost early through caries, but the lower incisors are in correct alignment, and it may be noted that the child began with irregular mandibular incisors (like her mother), and ultimately they became normally arranged (like her father).

He would like to add in conclusion that he approached the case in a spirit of alternate fear and hope rather than with any foresight as to the ultimate result. He would not have taken much notice of the models or the case in the usual course, had not the President, to whom he showed the models, suggested their exhibition to the Society.

Discussion.

The President said the models Mr. Davie had shown were very interesting. He would like to ask if there were spacing of the deciduous teeth prior to their being shed.

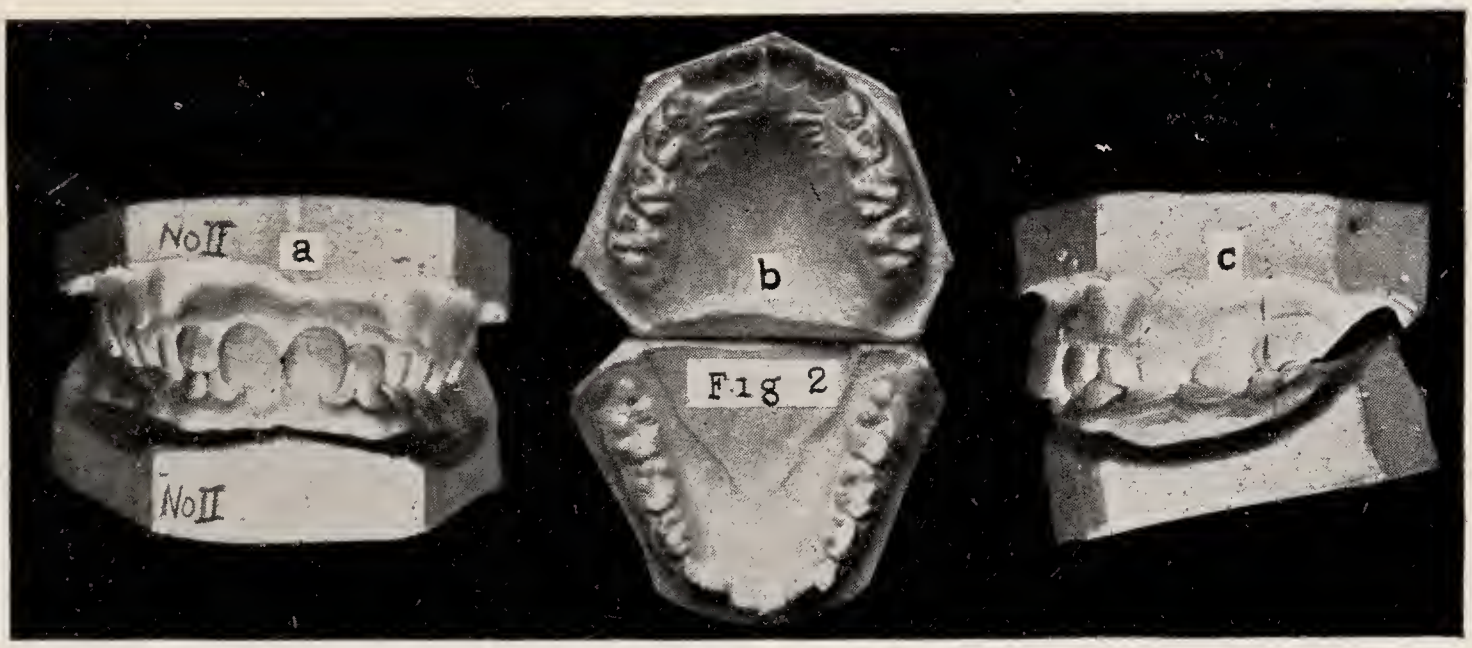
Mr. Northcroft congratulated Mr. Davie very heartily on his presentation of the case, and the President on being instrumental in bringing it before the Society. It was the type of case, he thought, which was of great value to the members of the Society, because it helped to teach such a lot, especially on the

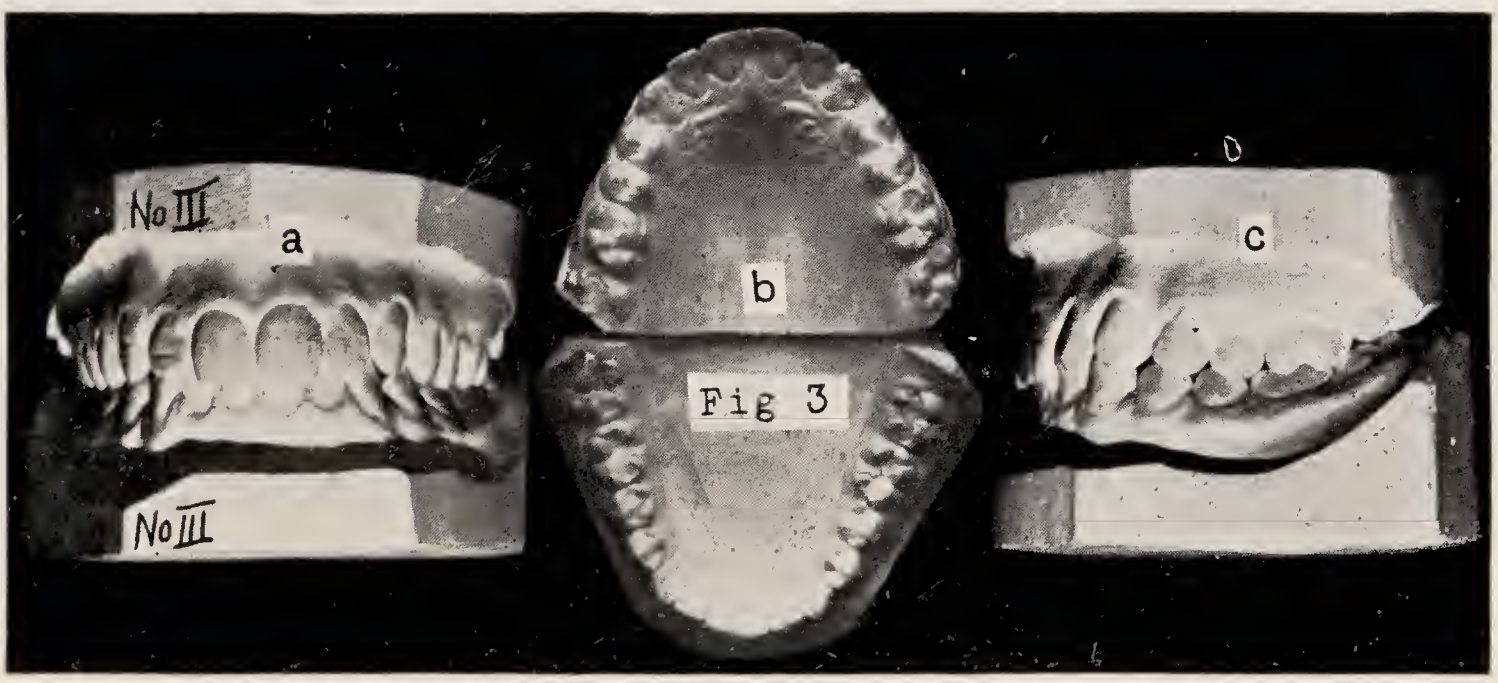
A CASE OF NORMAL DEVELOPMENT.

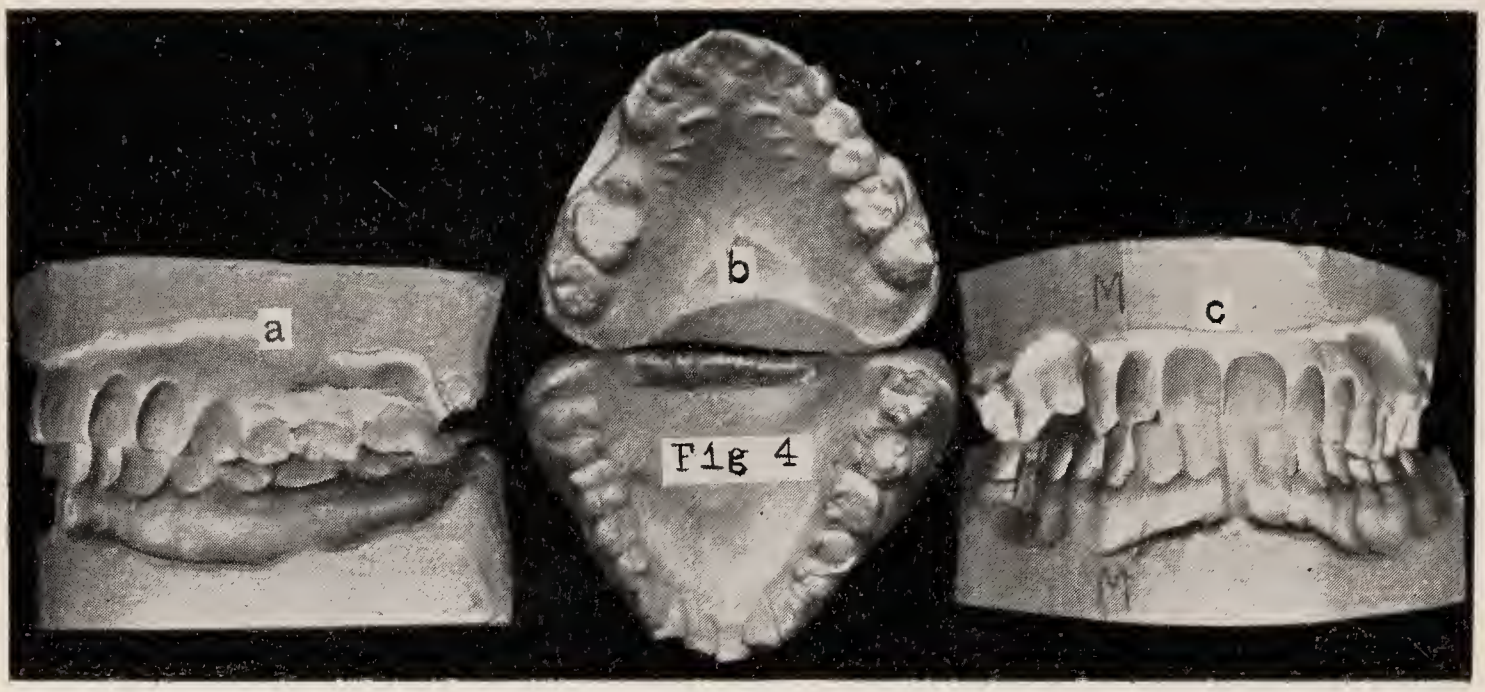
BY A. M. DAVIE, L.D.S.

Fig. 1(a) is shown in incorrect occlusion owing to photographer's error.

Fig. 1(c) is shown in incorrect occlusion owing to photographer's error.







Mother's models

side of non-interference too early. He was a great believer in early interference, but the problem of when to interfere and when to leave well alone probably needed more judgment than any other question in orthodontics. He had always been a great believer in members taking serial models and keeping them, and the present communication afforded a striking example of the wisdom of that practice. By taking and keeping his models over a series of years, Mr. Davie had proved a point which could not possibly be proved in any other way. No one would have believed Mr. Davie if he had simply said "Here are the models I took in 1924. I assure you the child has now perfect occlusion." The production of all the models, however, proved the point, and made the communication a very valuable one.

Mr. SAMUEL thanked Mr. Davie for his very interesting communication. The cynical thought came to his mind when listening to it that perhaps some of the cases treated would have been better untreated. It occurred to him that a possible explanation (if Mr. Davie was looking for one) in the particular case in question was that the child was happy in having particularly large deciduous second molars.

Mrs. LINDSAY said she was very much interested in the case Mr. Davie had described, but would like to know what would happen when the wisdom teeth came in; if Mr. Davie was able to take and show models when that happened it would be very interesting. There was a series of models, which perhaps Mr. Davie saw, at Liverpool of the mouths of children from early years up to 25. About the age of 12 the teeth were quite normal and there was very good occlusion, but when the wisdom teeth came in the incisors became irregular. She wondered whether in the present case the incisors might not overlap, as the mother's did, when the wisdom teeth came in.

Mr. PACKHAM said it would be interesting to know the history of the child from the general point of view, as to what illnesses if any she had had during the period when Mr. Davie was so fortunate as to be able to observe the case. Some reference had been made to the use of elastic bands, and he would like to know whether any treatment was necessary to bring the two central incisors together, and whether the general bone growth was normal or abnormally accelerated during the period under review.

Mr. DAVIE, in reply, said the President had asked if there was any spacing of the deciduous teeth prior to shedding. There was none; the temporary dentition was normal. All the upper and lower teeth were perfectly aligned; and there was no irregularity. He began examining the child's mouth at the early age of $3\frac{1}{2}$ or 4.

The PRESIDENT said his point was not so much the irregularity of the deciduous dentition as the question of spacing, the actual spaces between the teeth.

Mr. DAVIE said there were none; the teeth were all touching laterally. Mrs. Lindsay would like to see the models when the wisdom teeth came in. He would do his best, but was afraid to make any promise. Mr. Packham had asked from what illnesses the child had suffered. He had followed the course of the child's growth very carefully, but he did not remember any illness other than mumps. As to treatment, he gave the mother a box of small elastic bands to put on at night, and he thought the child wore them for about three months. He did not know if it did any good, but supposed it helped a little. They were worn only at night, because the mother thought the space was rather unsightly. He did not think it had much effect in bringing them together. Mr. Packham's last question, as to whether the child grew normally, was rather difficult to answer. He thought she had grown rather quickly, but, like other children, she seemed to have growth periods. Speaking generally, he thought the child did grow normally.

Mr. NORTHCROFT, referring to the use of elastic bands, said he wished to give a most earnest warning to young orthodontists against their use uncontrolled. He had seen cases where the band had slipped up the neck of the tooth and it had been lost in consequence. It was most important not to give apparatus to mothers or nurses to apply at their own sweet will.

Mr. STEADMAN recalled one case he had come across where an elastic band was put on the two upper centrals and two upper incisors, and passed over those four teeth; he saw it in the palate above the actual roots of the four teeth. The whole of the bone supporting the four teeth was loose and had to be taken away together with the teeth. The band was high up in the palate.

ENVIRONMENT, HEREDITY AND MALOCCLUSION.*

By S. Wilson Charles, L.D.S.R.C.S.Eng.

The object of this paper is to arouse interest in a form of investigation which is an earnest need of many students. Those who are interested in the study of bird life will have noticed a very definite change of thought during the last few years. It might almost be said to be a revolt of the younger generation against the tyranny of the older. Some writers even have stated this in definite terms ; but, whatever the facts of the change, it is taking place. It is apparent to all real students that very little is known about birds, or for that matter about the other inhabitants of the wild.

There is hardly a text-book on natural history, from the view-point of wild life, which does not abound in mistakes. There are many reasons for this, the chief of which is that the subject is vast and the writer, having only a limited experience, has perforce to copy from other books or listen to the tales of others, who in turn have got their tale from somebody else.

It is hoped that by the cultivation of the true spirit of observation among thousands of people certain definite facts may be noted, so that in the years to come a fuller understanding of the real life of wild things may lead of itself to the solution of such problems as migration or nest building. It is this spirit of patient learning which is going to be the great force in natural history, and it is the learning of simple folks and their experience which will solve many of the great problems of life.

It does not require very much experience to realise that very little is really known about the facts of the evolution of the present types of living animals as we know them. Scientists differ in their interpretations of things which are often of a purely theoretical nature themselves. There is an old Chinese proverb " When two men quarrel about the price of an onion, who shall say what happened in the time of Yu ? " When half a dozen scientists quarrel about the significance of a fossilised bone, who shall say what the specimen really looked like in the beginning ? The theories of evolution as relating to Man are to-day accepted as a fact by most scientists, though there are many who do not accept them with the whole-hearted assurance of a few years ago.

A letter from Mr. J. T. Cunningham appeared in the *Daily Telegraph* a few days ago in answer to a letter stating that the facts of evolution were not proved. Mr. Cunningham first refers to the assertion that " There is no evidence in favour of evolution that an expert lawyer, properly briefed, could not tear to shreds with the utmost ease," and he said that that was probably true, but that what an expert lawyer could do, when sufficiently paid, was not a test of truth. He went on : " Scientific evidence is very different from legal evidence. The evidence which proves the truth of evolution can be stated very briefly. Firstly, there is no evidence that animals or plants as individuals ever arise except as the offspring of pre-existing individuals. Life may have originated in the first instance on this planet from non-living matter, but no satisfactory evidence of one of the higher forms of

* *Transactions* of the Society, February 3rd, 1930.

animals or plants arising otherwise than by reproduction from parents has ever been produced. There is no evidence in the case of man or any other animal of complex structure that the succession of generations has ever been interrupted since the beginning of life. Secondly, the kinds of animals and plants existing at the present time have not always existed. The evidence of the fossil remains in the rocks show that in earlier ages the forms of the present time did not exist, but the remains of quite different forms have been preserved. There were periods when man did not exist, earlier periods when there were reptiles but no mammals, still earlier periods when there were no reptiles or mammals, but only fishes, still earlier when there were no vertebrates but only lower animals. Existing animals must be the descendants of the animals of former times, and all the scientific evidence shows that these ancient animals were different from those now existing. Therefore there must have been change in the course of generations, which is what is meant by evolution. To say that there is no evidence that man has evolved from a lower to a higher form is not correct. There is evidence from the study of fossils that the earliest mammals were evolved from reptiles, and no remains of man have yet been found in the periods when these transitional forms existed, or at any earlier period."

I cannot help feeling that the writer of the original letter has a very strong case, for Mr. Cunningham's letter defeats its own object. He says, for example, "no remains of man have yet been found." How can he be positive that they will not be found ? I am quite sure that they may be. He goes on to say "Biologists, therefore, conclude that man originated by evolution from primitive mammals," and he says this is the conclusion from scientific evidence. The man who believes dogmatically in evolution as being a fact on the present evidence, however, is in a very weak position.

The theory of evolution has, of course, fixed itself firmly in the mind of all who are interested in the study of living things, even among those who are inclined to disbelieve it. The modern horse has one toe ; the supposed original horse had three. The original horse lived in a forest, but when he came on to hard ground it is said that, being handicapped by his three toes, he changed them in process of time into one. I cannot understand the explanation about the hard ground, for the modern zebra, which I take it has some relation to the horse, has one toe, but spends all his time running about with two-toed antelopes and gazelles. Why should the zebra have one toe and the antelopes two, living as they do under the same conditions ? There must be an explanation, but it is not the hard ground.

We know very little about the lives of animals, though with the modern tendency of sportsmen to hunt with the camera instead of the gun more is being learned. It is a pity that those who really know something about these animals should be the ones whom it is most difficult to induce to relate their experiences, for most of the camera studies one sees are by people who do it for money and not as a scientific pursuit. Africa is still the dark continent, though it is fashionable to say there is very little left to explore. Most people walk over the unexplored parts without knowing anything about them.

The ways of elephants are past understanding. There is a herd of

elephants living somewhere in southern Sudan which on practically the same day every year crosses the Msindi road going south. Nobody knows why these elephants go south and nobody knows what they do when they get south, but the extraordinary thing is that on a certain day every year they move south.

The tsetse fly which produces horse sickness exists in certain belts. I have lived in those belts, and if you go through them in a car both you and the car are covered with them, but when you go twenty yards or so beyond the border they disappear. The same thing occurs with the tsetse fly which causes sleeping sickness.

When we come to the accepted facts of heredity, there still seems to be great difference of opinion. In the latest book I am astonished to find that the Shetland pony is an achrondoplastic dwarf. Perhaps I should have known this. But I really cannot accept the assertion that the St. Bernard, the Great Dane and others are acromegalic. Is the modern Airedale acromegalic because he is half as big again as he was twenty-five years ago ?

There is, moreover, a great divergence of opinion about observed facts which makes things even more difficult. Take the case of toes in the human being. Arbuthnot Lane and others state that the second toe is normally longer than the big toe ; on the other hand, Gates, in his book on Heredity states that the big toe is normally longer. As for the influence of environment, who shall say what happens ?

During the last few years we have heard much about the native of Africa, especially in the *Daily Mail* and from the New Health Society. We have been told of the advantages of primitive life and how it brings health in its train ; we have been advised to seek the sun, the giver of life and the cure of all ills. It has been asserted so often that the native of Africa should set the pattern on which we in England should live that we are almost beginning to believe that it is true. It is said that the diseases of civilisation are practically non-existent among primitive tribes, some writers claiming that this is due to the fact that natives are never constipated. It is said that the teeth and jaws of natives are well formed when they live in their primitive state, and that when they adopt the habits of the white man their teeth become carious. I should like to see some definite work done on this subject, for it is my experience that among many primitive tribes caries and malformed jaws are more common than is usually supposed, and that there must be some other factor besides civilised food to account for the fact—if it is a fact—that primitive natives with supposed good teeth develop caries on coming in contact with civilisation.

Personally, I should say there is a great deal of disease among primitive tribes. On the east coast of Africa you see every disease under the sun. The sun is a hard taskmaster, killing as often as curing when taken in the doses of Central Africa. One of the early arrivals in Unuyoro, which lies between the Sudan and Uganda, said that the infant mortality was 90 per cent. I believe this was in 1882. In the *Observer* lately, I saw a report on the native question in South Africa, and it was there stated that the result of investigations showed that amongst the natives in South Africa the infant mortality was 700 per 1,000, which is 70 per cent. There is no doubt that whole

nations have been swept out of existence by disease within our time, and to-day syphilis decimates large tribes to an extent undreamed of in England.

The truth of the matter is that very little is known about life generally ; the subject is so vast that it is difficult to correlate all the facts that have been collected, and it is difficult to resist the temptation to fill in gaps in our knowledge from unreliable sources. As an example of what I mean, there is practically no limit to the credulity of the general public and scientists ; on the other hand, if they are not to be gulled they are equally obstinate. It is very common for a Cook to discover a North Pole. You would be astonished at the number of famous people who claim to have climbed Kilam'njaro, and yet, when in 1849, Kraft said there was snow on Mt. Kenia, a mountain on the equator, the scientists of the world laughed him to scorn. It was not until Joseph Thompson went through Masai Land about 1885 that that statement, made 35 years before, was accepted. Yet Mr. Cunningham says when new evidence is discovered it will be accepted. I hope it will ; but I am doubtful, for scientists are the most obstinate of men.

In his presidential address in 1925, Mr. Harold Chapman spoke of the possible influence of Murk Jansen's theory of feebleness of growth on the developing jaws and the production of malocclusion. In 1926 I read a paper on somewhat similar lines. I was at that time a more confirmed believer in feebleness of growth than I am now, not because I think it is wrong, but because it is so difficult to obtain any definite proof of it.

One of the families to which I wish to refer consisted of seven living members who had been brought up under the most poverty-stricken conditions, but in the country. The jaws of the four younger members were beautifully developed and comparatively free from caries. The three elder children are all married and have children of their own, but unfortunately neither of the parents of the seven has any teeth left. The child of the eldest girl, who always appeared to me to be a poor thing, is a seven-months twin with a cleft palate. According to some theories, cleft palate is inherited, but I cannot find any history of cleft palate. The other twin died at birth. This one was given up also, but after a long period of uncertainty my wife persuaded the mother to feed the child on dried milk, and the child has done wonderfully ever since.

The next family of which I am able to make a fairly complete history is one of four children. I am sure the only thing to do is to collect the evidence which comes our way and wait until the next generation have children. It is almost impossible to obtain casts of unmutilated mouths in the grandparents of our present families ; it is very difficult to obtain unmutilated mouths in the parents. It appears to me that the only way out of the difficulty is to take modern parents and their children and wait until those children have offspring of their own. It requires patience and determination, but it can be done, and it is a pity we did not think of it years ago.

The paternal grandfather in this case was normal, but the paternal grandmother was doubtful owing to early mutilation and neglect—I mean neglect from the point of view that people sixty years ago did

not bother so much about teeth. I am inclined to think, however, that there was probably some slight abnormality or irregularity, but this was probably acquired. There is no evidence about the maternal grandfather, though he certainly had a history of a canine tooth in the roof of his mouth. The maternal grandmother had normal occlusion, though the bite was edge to edge. Her teeth were retained nearly all her life, for she lost the greater number of them at about sixty-eight. There is thus little evidence to be got from them, unless edentulous models give any information.

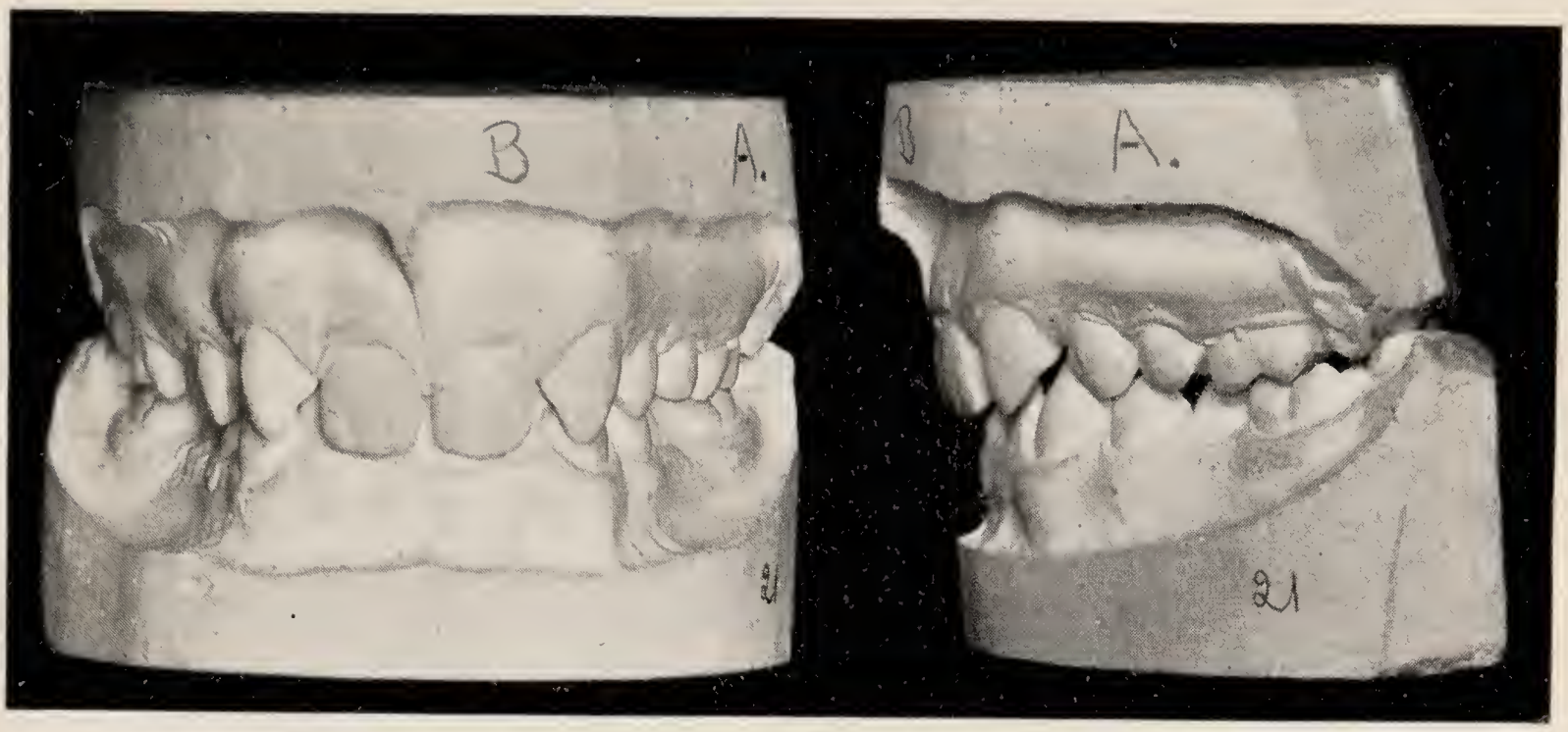
The father's mouth was normal, with a slight overbite. The mother's bite was apparently normal, though there was an early history of malocclusion. The two centrals were separated with the canines high up. The two centrals were pulled together, I regret to say, with elastic bands ; the result, however, was remarkably successful, and apparently the canines came into position. Two paternal brothers and one maternal brother all had normal mouths, though one brother in each family had very hypoplastic teeth. The family in question is interesting. The ages of the children now are 17, 15, 9 and 2, and all are girls. I will refer to them as A, B, C and D.

Child A was above the average height and weight and had the general characteristics of the maternal grandmother. She weighed 6 lbs. at birth and was a poor feeder. The pregnancy before she was born was not particularly good ; that is to say, the mother was not particularly happy. She suffered from glands in the neck at the age of three, but these disappeared after a visit to Margate.

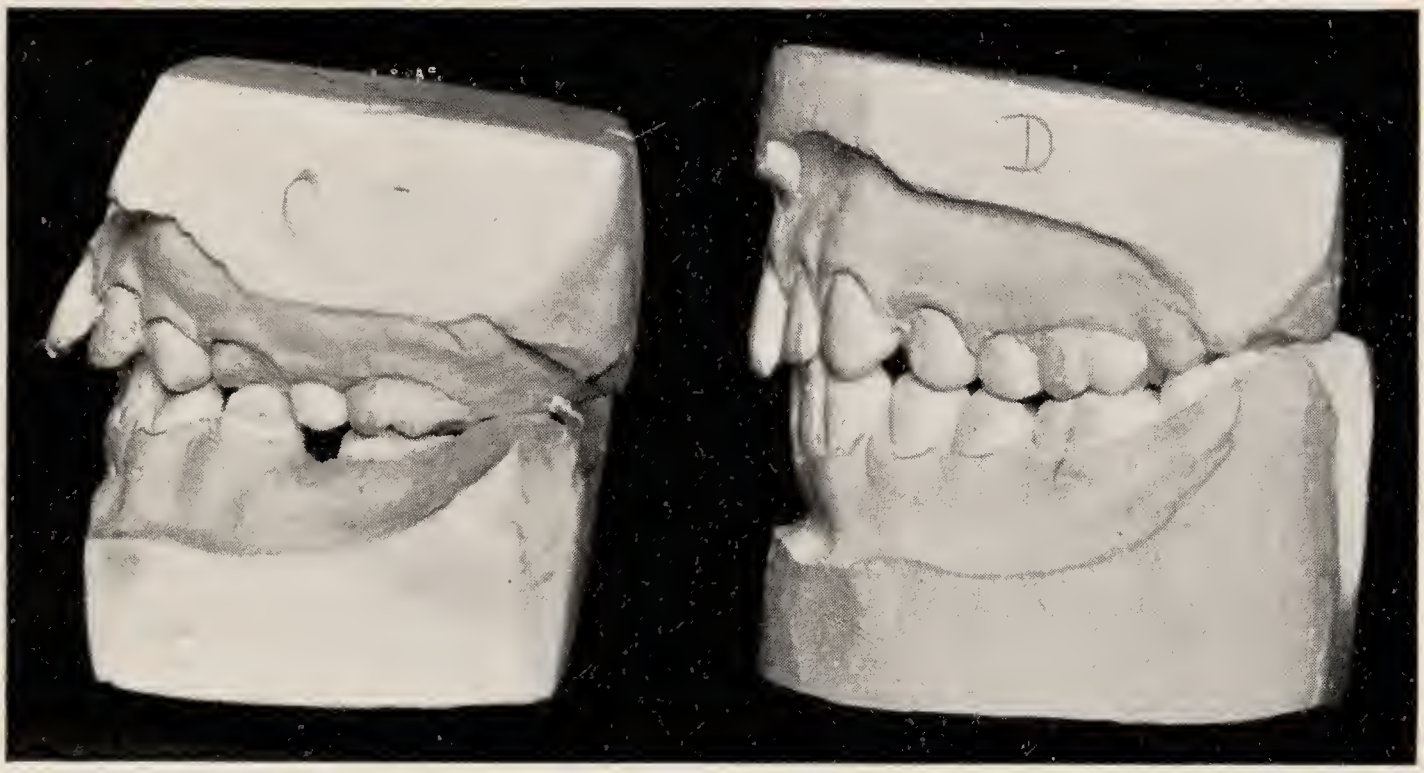
Child B was also over the average height and weight and had the general characteristics of the maternal grandfather. She weighed $5\frac{1}{2}$ lbs. at birth, but was a poor feeder. The pregnancy in this case was good. She suffered from a condition which we now know as acidosis, but which was originally thought of as biliousness or migraine. The child had measles at the age of twelve and tonsils and adenoid trouble between the ages of eight and nine.

The third child, C, was also over average height and weight and had the general characteristics of the maternal grandmother. She weighed 8 lbs. at birth. The pregnancy was good. She was bottle-fed and a very good feeder ; she was especially fond of raw meat. She had measles at the age of six and tonsils and adenoids removed at the age of five. She had the largest tonsils I have ever seen.

Child D was born prematurely, at just over eight months. It was a breach presentation and it was with the very greatest difficulty that the child was kept alive. The pregnancy was extremely bad from beginning to end, though whether that was due to the fact of a breach presentation or not the various doctors who saw her could not determine. For the early part of her life she was a breast-fed baby. For the first few months the life of this child hung "on a thread." It was very difficult for her to keep any food down ; her entire digestive system was out of order. The child was a vegetarian feeder. At the age of nine months she was taken to live on a farm. She lived in a tent and was fed on the milk of a special cow, and from that time she has never looked back. At the age of just over two she does not walk, but it is a little difficult to determine whether it is that she cannot walk or will not walk. She has been known to walk, but the nurse was so astonished that she gave a loud yell and the child dropped on the floor. She can cross the floor at a remark-



CHILD A.



CHILD B.

CHILD C.

Illustrating Mr. Wilson Charles's Communication.

able pace and I have seen her in a field going across the field in the same way and surrounded by large numbers of turkeys and little pigs. She thrives in the open air and immediately relapses when brought inside.

I should mention that as far as the other characteristics which may be said to be hereditary are concerned, the paternal family have all suffered from an affection of one eye. I suppose short-sightedness is about the best word for it, but various eminent oculists strongly recommended not wearing glases for this condition. The paternal grandmother had it and the three sons of the paternal grandmother. In the case of child A, this affection is in the left eye and the child is left-handed. The left-handedness is apparently from two sides of the family. B has apparently normal eyes. C is ambidextrous and has short-sightedness in the right eye. It is, of course, impossible to say with a child of two, child D, whether there is any trouble of this kind.

When we come to the mouths of these children we find that child A has no laterals and no wisdom teeth ; child B has wisdom teeth as in the case of the father ; that is to say, two lower wisdom teeth, the upper right wisdom tooth absent, and the upper left wisdom tooth simply a peg of quite characteristic shape. Child D suffered from marked inferior retrusion at birth. I have been unable to obtain any models, but I have an X-ray photograph showing the condition. Her teeth are now showing superior protrusion, but her first molars, which are the only molars present, are apparently in normal occlusion.

[Mr. Charles here exhibited three slides illustrating the dental condition of the first family. All have beautifully developed arches and perfect occlusion, and yet they have come from a most miserable home.]

Mr. Charles here showed slides illustrating the dental condition of the 2nd family. With reference to the child A, who had no upper laterals and no wisdom teeth—the point I wish your opinion about is this : On the left I show the mouth as it was four years ago, while the one on the right was taken during the last holidays. In my opinion the condition is infinitely worse than it was four years ago. Four years ago I was advised to leave the matter alone, but I am not sure I did the right thing in doing so.

These models were taken from the child B, and are better articulated together because I think her lower molars are in what is called a buccal occlusion. She was a very pronounced thumb-sucker from a very early age, and she apparently went on sucking her thumb until she went to school at the age of twelve, but she did it at night when she was quite unconscious that she was doing it.

This is the same child taken some years afterwards. The first lower bicuspid is behind the first upper bicuspid. I am of opinion that her thumb-sucking pushed back her lower teeth on that side. The molars there are apparently in normal occlusion.

These models were taken some two years ago. You will see that the lower bicuspid that was missing before has come into position. This is the child who has two lower wisdom teeth, the upper right wisdom tooth missing and the upper left as I have already described it.

This is the child's model to-day. She stopped thumb-sucking as I have said, at the age of twelve.

If you will examine the models you will see what a marvellous change has taken place in the mouth.

This is child C. The top model was taken at age eighteen months,

and you will see there was quite a V-shaped arch. It is practically the same in the next. She was then persuaded to stop thumb-sucking, and the slide shows also her arch at the present day. Immediately she gave up her thumb-sucking she lost the V-shaped arch.

This shows an X-ray of the eldest child and shows the extraordinary development of chin which she has.

Here you have a family who have in the case of the first child remarkably irregular teeth due to the fact that some are missing, and in the case of the next child if you look at the models you will see a most remarkable change has taken place without any treatment at all. Child C undoubtedly had a V-shaped arch, and on the cause of that, thumb-sucking, being removed, it returned to normal. D has marked inferior retrusion at birth which, unfortunately, I cannot show you, but apparently her mouth is now getting normal as her health improves.

The relative positions of heredity and environment in growth are still the subject of considerable difference of opinion, principally, I think, because so very little is known about them. I think from my own observations that environment plays a small part in comparison with heredity, but this is only a personal opinion which I am trying to forget, because I am convinced that for the next few years we should all make a determined effort to learn everything we can about the simplest growth changes, and later perhaps, we shall be able to grasp the significance of our collected knowledge.

Discussion.

The President said Mr. Wilson Charles had given a very thoughtful paper, and personally he was very interested in some of the illustrations with regard to the question of heredity. A short time ago a case was brought to his notice of webbed feet persisting through three generations ; the skin grew between the second and third toes in both feet in the three generations of the same family. Perhaps Mr. Wilson Charles might be able to explain another thing he had observed and for which he had never found any real reason, namely, as to why it was that some children just before they were able to walk moved about the room, some crawling on their hands, feet and knees, and others propelling themselves about on their little bottoms by sitting down and using their heels and hands. It was a minor point, but he thought it was of some interest. He noticed Mr. Wilson Charles ranked the influence of heredity much higher than that of environment as a cause of malocclusion, and showed cases where, when the cause of malocclusion was removed, the condition almost returned to normal. One knew, however, that cases of malocclusion occurred which could be proved to be largely influenced by heredity, and in such cases at any rate, after orthodontic treatment of the malocclusion the irregularities and deformities did not return.

Mr. Bragg asked Mr. Wilson Charles whether he could say anything on the point Mr. Northcroft made at a previous meeting. By attributing the trouble to heredity one only pushed the question back to a previous generation ; it still had to be determined how the malocclusion originally occurred, whether it arose as a result of environmental conditions or not.

Mrs. Lindsay said Mr. Wilson Charles had given them a great deal to think about and had crowded so much into his paper that it was difficult to take up the points as they arose. With regard to the first part of the paper, in which he seemed to throw doubt on evolution, she wondered how he accounted for all the evidence that had been brought forward from time to time with regard to the anthropoid condition of the newly-born child. If, for example, a baby was given something small to pick up it pushed it ; it did not understand how to grasp or to use its thumb. That was an anthropoid trait, and there were many others. There was also the question of the tail. In the late war, she believed, there were many evidences in the examination of recruits that there had been a tail at birth and that this had been amputated. There was also the question of gill clefts. Those points seemed to suggest a lower

stage at some time or other. There was, of course, a remarkable adaptation of one part of the body when another part was lost. Bland Sutton showed a case in which a great toe was lost and the second toe took on the form of the great toe. She wondered whether Mr. Wilson Charles was acquainted with Mr. Wood Jones's book *Arboreal Man,* which seemed to suggest that the human foot was going in the same way as that of a horse, and that one day —thousands or even millions of years hence—human beings would have one toe instead of five.

Mr. LIVINGSTON said, though he had followed the paper with great attention, he was not clear as to the point of it, except that Mr. Wilson Charles seemed to have become an agnostic and not to believe in anything at all. He would like Mr. Charles to clarify his position and define it with regard to heredity, acquired and congenital disease, environment and habit.

Mr. LINDSAY said that Mr. Wilson Charles had stated in the early part of his paper that the object of a paper was to promote discussion. He did not know whether it was in some sense a reflection on that remark that Mr. Charles had by his paper practically killed discussion. However, there were points in which he thought Mr. Charles might be commended for that. He gathered from his references to natural history that in future "out of the mouths of babes and sucklings" there would come the science of ornithology, and he presumed the author was going to discover the science of orthodontics in the same manner. Putting that aside, he thought Mr. Charles had called attention to a condition of affairs which required change. He had directed attention to the type of research from which it was likely that in the future the most valuable results would be obtained. At present a fair amount of money was being spent on research—so-called research as to a large amount of it—and one was apt to place too great value upon things that were done in laboratories and on experiments on animals which really did not take one very far. He thought it was time to get away from that, and he believed that was what Mr. Charles had in his mind, namely, that it was from the clinical observer that the great mass of valuable research would come. It was impossible to do without experiments in the laboratory, or without the mathematical measurement of the jaws, but these had been promoted to an importance which they did not deserve, and he gathered that Mr. Charles thought that such a society as the one he was addressing, by a careful collection of cases and a tabulation of results from actual experience in clinical practice, would probably do as much or more for orthodontics than these other methods. He was not going far into a discussion of the cases by which the author supported his argument that nothing whatever was known about orthodontics. It was a little difficult to keep the cases in one's mind while listening to the paper. He wished the Society would revert to a practice which it formerly followed, namely, that of issuing galley slips of the paper before it was presented at a meeting, so that the members could look at it and frame some ideas which might be of value for the discussion and give the reader of a paper the support he deserved. It was quite impossible to give serious consideration to the points brought forward merely by listening to them as they were referred to and they were exceedingly interesting points. He was tempted to remark that the deformity in the case of thumb-sucking referred to was a departure from the normal caused by the thumb-sucking and that there was a return to it as soon as the thumb-sucking was given up. It was a normal case at the start, though distorted by adventitious circumstances for a few short years, reverting to normal as soon as it had a chance to do so. The other cases were exceedingly interesting, though nothing was said about the condition of the teeth with reference to structure and decay. From the models shown on the screen it would seem that there were comparatively few cavities present. He thought it possible to sum up the position by saying that, after all, very little was known about the great questions of heredity and environment, and perhaps even less of the principles underlying malocclusion, but Mr. Charles had shown the way which must be followed in order that something might be learned on those great matters, and on that account he would like to join with others in thanking him for a very enjoyable evening.

Mr. WILSON CHARLES, in reply, said the President had referred to webbed feet. A book entitled *Heredity in Man* had just been published by Gates, which went into the question very fully. Much was said about webbed feet in that work, which was one he intended to offer, if the Society would accept it, to the library in company with one or two other books which he hoped

might be of interest. He had not the remotest idea why children crawled as he had had very little experience of crawling children, but most of the children with whom he had been connected seemed to have progressed feet first. He had spoken on a former occasion about the question of environment and heredity, and had pointed out that in a case where the environment had produced the malocclusion, when the cause which had produced the malocclusion was removed there was a tendency to return to the normal condition. On the other hand, when the malocclusion was inherited—whatever view one held about that—it did not return to normal. Mr. Bragg asked about the cause of the malocclusion in the parent. That was a matter he had not discussed because it required a considerable amount of experimental evidence which he had not been able to find. His own impression was that there was no reason why, if two types were crossed, some irregularity should not be produced. If a bulldog were crossed with a retriever or a greyhound one was very likely to get some peculiar formation of the teeth in the progeny, and in the same way by crossing two somewhat dissimilar types of human beings malocclusion might conceivably be produced, though that was a matter on which he hardly liked to express an opinion. Mrs. Lindsay and Mr. Livingston suggested he was doubting evolution. His point was not that he doubted evolution, but that evolution was regarded by the majority of people to-day as fact absolutely proved, which it was not ; it was still a theory. What was so remarkable was that even those scientists who doubted evolution—and there was quite a number of them—were so impressed with the idea of evolution that their conversation was all in terms which showed that at the back of their mind they believed in it. Evolution had become a fact to them, and yet evolution, as it was generally taught, was quite unproved. He read Prof. Wood Jones's book some years ago but could not remember what he thought about it. He would be pleased to explain his views to Mr. Livingston and to explain to him that he was not so much an agnostic as he might have given people to think. He would like to thank Mr. Lindsay for restating the object of his paper. The paper was intended to promote discussion, but it was primarily intended to interest people in the collection of statistics about the matters with which it dealt. He was perfectly convinced that much more was going to be done by the collecting of clinical facts about such matters than by any amount of laboratory work. He had done a considerable amount of laboratory work at one time himself and he still did it, but nevertheless he was quite convinced that it was only by the collection of statistics in the way he had suggested—it did not matter whether it was with regard to birds, animals, or human beings—that it would be possible to learn something about what really happened. As far as the models he had shown were concerned, the children from whom they were taken were all practically free from caries. He thought, however, that that was only because their teeth were X-rayed three or four times a year and the earliest traces of caries removed, because he found with all of them caries tended to be very rapid when it started. He thought on an average they had only two small holes each. Mr. Lindsay remarked that when child B stopped thumb-sucking her teeth returned to normal. The interesting part was that when she was quite tiny her molars were in buccal occlusion, so that there was apparently some tendency to irregularity. She sucked her thumb until she was twelve, but now that she was fifteen years of age her teeth were gradually returning to normal. While he was convinced that that was due to the fact that the cause had been removed and there was a natural tendency for her teeth to return to normal, yet it was rather remarkable that after a child had consistently sucked her thumb like that the teeth should return to normal. He thought the girl was very lucky to have teeth which behaved like that.

An ordinary meeting of the society was held at 11, Chandos Street, Cavendish Square, on Monday, March 3rd, 1930. The President (Mr. H. E. Marsh) was in the chair.

After the minutes of the previous meeting had been read and confirmed, two new members, Miss Russell and Mr. King, were welcomed by the President and signed the Obligation Book.

Mr. Royston Hughes, L.D.S.Eng., was, by a show of hands, unanimously elected a member of the society.

Miss K. C. Smyth then read her paper The Ætiology and Treatment of Abnormally Rotated Molars.

THE ÆTIOLOGY AND TREATMENT OF ABNORMALLY ROTATED MOLARS.*

By K. C. Smyth, L.D.S.R.C.S.Eng.

Introductory.

My reasons for choosing "The Ætiology and Treatment of Abnormally Rotated Molars" as the subject of this paper are two. Firstly, the departure from the normal position and occlusion which is described as abnormal rotation is so small in terms of millimetres that it is an irregularity which is often overlooked. Thus the recognition of the importance of the diagnosis and treatment of rotations is not as widespread as it deserves to be. I think this is also due to the fact that the cases which come up for treatment have almost always much more marked symptoms demanding attention, and there is so much to be done, that a relatively small abnormality escapes notice, or, if observed, is dismissed as unimportant. Secondly, it is hoped to show that abnormal rotations of molars, as they will be described, have a definitely harmful effect on the occlusion of each case, even if small in actual dimensions; and, conversely, that correction of the abnormality results in a correspondingly definite improvement in occlusal relations.

I believe the first reference in dental literature to abnormal rotation was Hellman's in the *Dental Cosmos*, 1920[1], where he shows that this condition of the upper first permanent molars leads to confusion in classification. He states that in 800 cases examined there was a very high percentage of rotations of upper molars, and he illustrates a case where rotation of one upper permanent molar is associated with an apparent post-normal relationship of the lower teeth. The lingual relationships are also well shown. Mr. J. G. Turner [2], in his post-graduate lecture given in January, 1924, refers to four classes of movements of teeth, and recognises the "twisting" which takes place after extraction. But so far as I know the exact effect on occlusion brought about by abnormal rotation of molars has not been described, although the condition is now recognised and treated as routine practice by some orthodontists. Therefore perhaps it may not be out of place to go into detail about the subject.

The incidence of rotation, when a number of cases, or a series of models, whether selected or unselected, is examined critically, is surprisingly high. In a series of 100 models of cases undergoing orthodontic treatment of various kinds, 57 were found to show rotations of various degrees. In a series of 100 entirely unselected cases, children at London County Council schools, all of them boys between the ages of 9 and 10 years, the number showing rotation of upper molars was found to be about 60. The great majority of these were associated with premature loss of deciduous molars.

Even more surprising is the incidence in ancient skulls. Rotation of molars has been seen in two young Bronze Age skulls. One skull was reported by Dr. Menzies Campbell in the *British Dental Journal* [3] and photographs of the other skull have been very kindly

* *Transactions* of British Society for the Study of Orthodontics, March, 1930.

lent by Professor Walmsley, Queen's University, Belfast. Both these skulls will be described in a later section.

It is not often that one can investigate a sufficiently large number of ancient skulls to make it possible to give any reliable percentage, but I was fortunate enough to be allowed to examine the collection of Bidford-on-Avon Saxon specimens at Birmingham, 39 of which had a sufficient number of teeth from which to make reliable observations. Of this number, 22 cases showed rotations in some form—56 per cent. A number of these, however, were associated with great wear and consequent destruction of normal contact points.

From this high incidence it may be argued that, once more, the term "normal" is being abused [4]. It certainly cannot be used in this connection in the sense of "average," but throughout this paper, unless definitely stated otherwise, "normal" refers to the morphologically normal condition, the ideal normal. To support this interpretation of the term it is hoped, as has been said, to show that any deviation from the normal, however slight, has a harmful effect on the denture described.

An attempt will be made to answer some of the practical questions which may be asked in connection with this subject:

(*a*) What are the factors which may contribute to the cause of abnormal rotation?

(*b*) Does rotation materially affect occlusion?

(*c*) What is the definition of an abnormally rotated molar and how can it be recognised?

(*d*) Can rotation be treated successfully, and how?

Ætiology.

There are several factors associated with the causation of rotation of molars. Some of these are quite clearly defined and easy to recognise, both in their pathology and ætiology, while others are much more obscure. The cases which are complicated with other forms of malocclusion, as many are, of course are the most difficult to diagnose. I have attempted to classify all the forms that I have been able to distinguish, entirely from the ætiological point of view.

The primary cause in every form of malocclusion may be said to be either lack or excess of growth of bone; nearly always, of course, the former [5]. Some of the ways in which bone growth and development may be retarded or stopped will be described.

A. Accidental or Local Factors, not related primarily to General Development.

A1. Premature Loss or Interstitial Caries of Deciduous Molars.

Of all the factors which lead to the determining cause of rotation this is the most fruitful, and also the easiest to recognise. There are many forms and degrees of such rotations, but there are two strong tendencies to be noted. Almost always the rotation is in a medio-lingual direction (Fig. 1), and very often it is associated with a bodily forward movement of the molar.

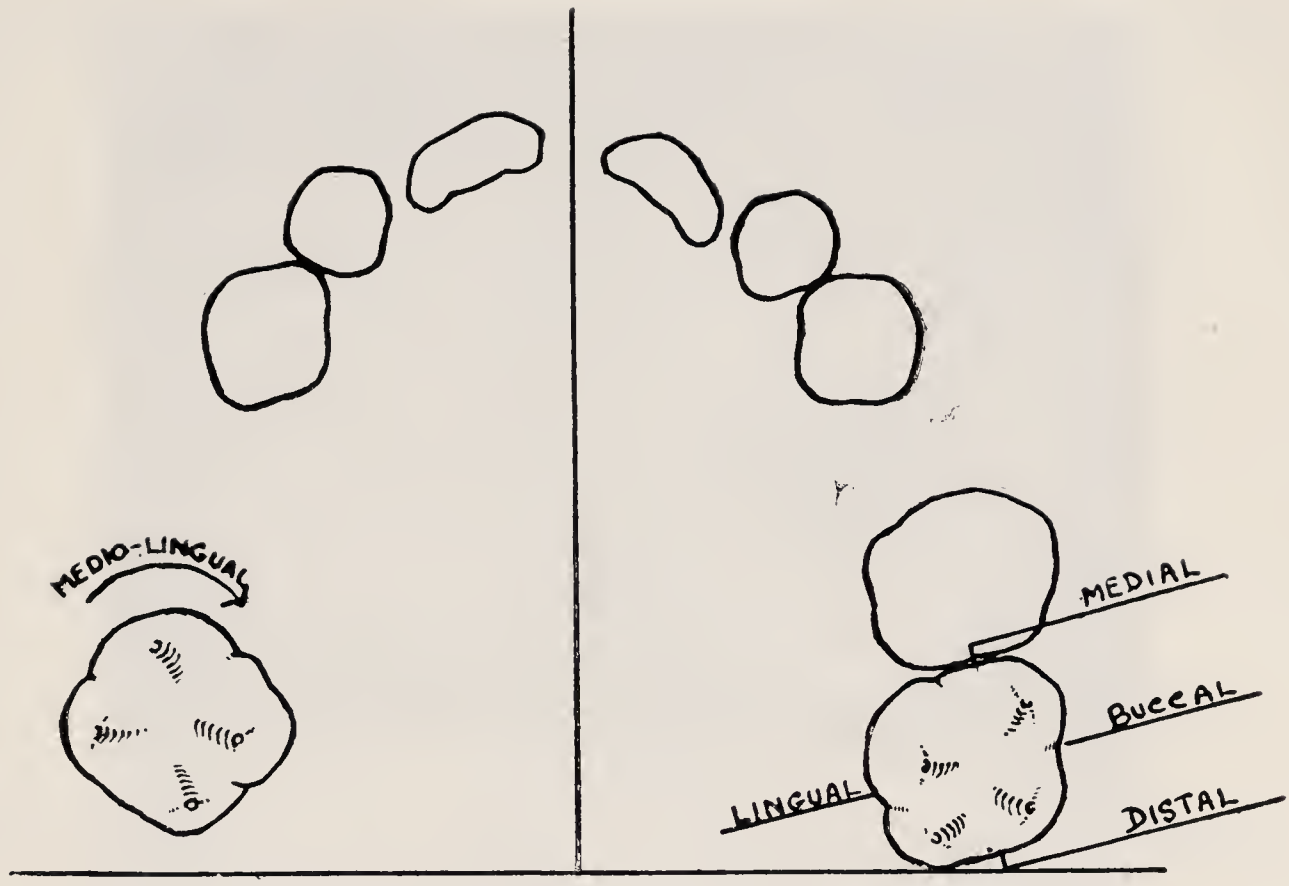


FIG. 1.—Diagram (reversed in the illustration) showing medio-lingual rotation of upper left first permanent molar.

This medial movement is simply the normal forward growth of the teeth, but proceeding in an uncontrolled manner because the contacts of the unbroken arch have been disturbed. It is the teeth anterior to the space created by the extraction that really suffer chiefly from the early loss, as they lose their impetus to forward growth which should have been transmitted through their distal contact points.

Other teeth also follow this general rule for forward movement into spaces, and even when there are notable exceptions, such as the distal movement of a lower premolar, this is actually less than it appears, since the whole of the arch has been growing forward in accordance with normal growth processes, while the premolar remains stationary, or perhaps does travel backwards a short distance through the avenue of less dense bone offered by the sockets of the extracted first permanent molars. This opening of a path of lessened resistance may be a factor in the movement of molars after the extraction of their deciduous neighbours, and there may even be some pull from the contracting tissues.

It is extraordinary in some cases to see the amount of space which is obliterated by this movement. In Fig. 2 the forward movement shown is certainly excessive, and comparatively little of it is rotation. The plane of occlusion is normal, showing that there is little or no tilting, and this is confirmed by the radiographs. As far as could be ascertained the extractions of the deciduous molars were performed about two and a half years before these models were taken, when the boy was about six years of age.

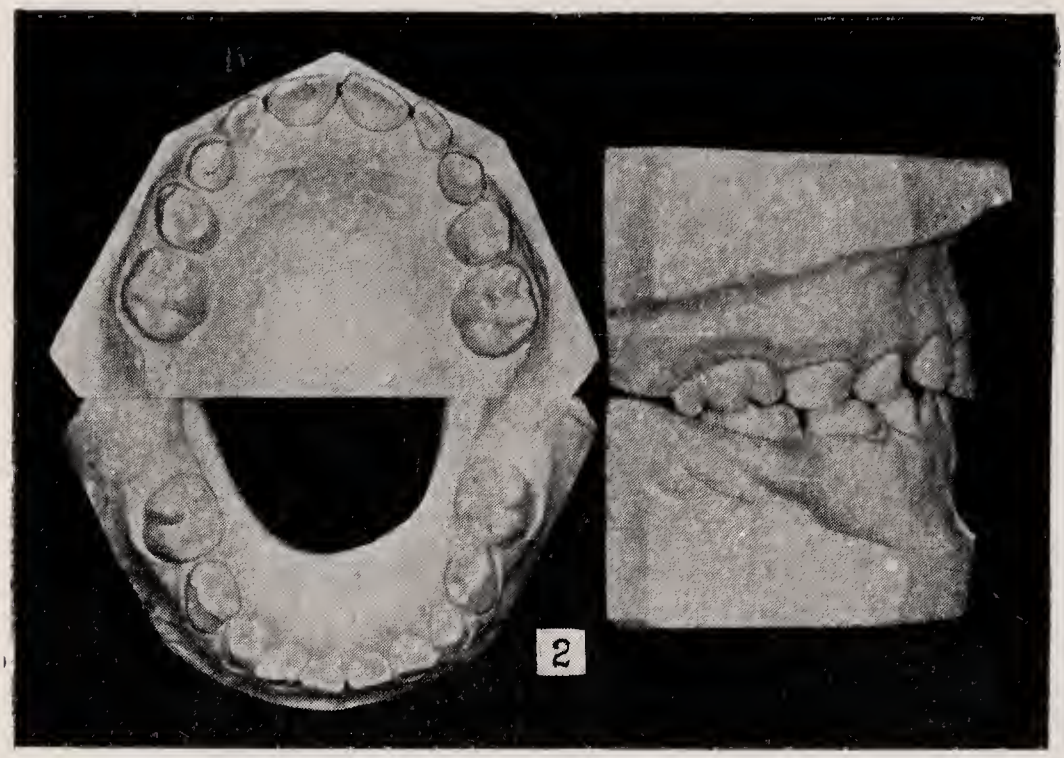


FIG. 2.—Forward drifting and rotation of first permanent molars following premature loss of deciduous molars. Anthropometric Committee, Medical Research Council.

In the great majority of cases of early loss of upper second deciduous molars the permanent teeth lose no time in encroaching on the space at their disposal, whether they are controlled by occlusion or not (Figs. 3, 4). Occlusion has a variable effect. In some cases the molars lock in correct occlusion and rotate together; sometimes they rotate together in incorrect occlusion. Often the upper rotation is independent of occlusion altogether.

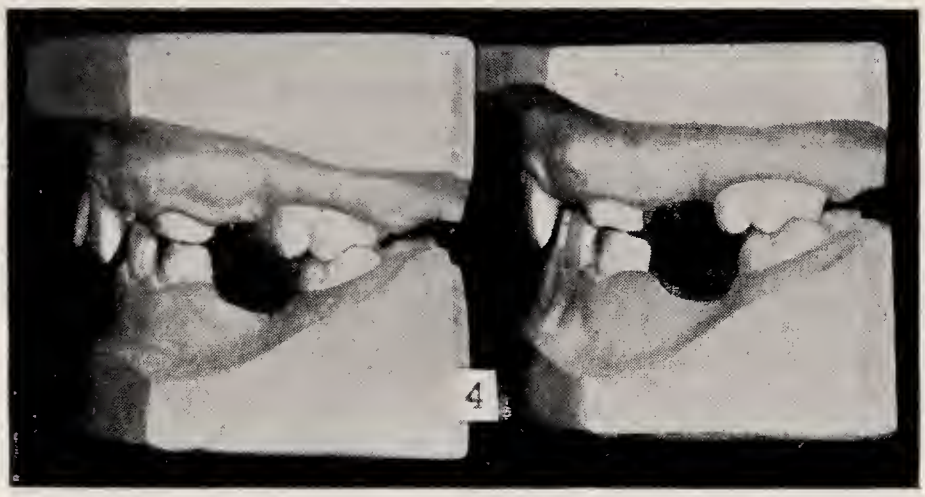
When the contact point of the second deciduous molar is lost through caries, the permanent molar appropriates the extra space by rotating in a medio-lingual direction. This abnormality persists, and may be increased when the deciduous tooth is finally lost, thus robbing the second premolar of its share of space. This is one instance of the importance of good conservative treatment from the orthodontic point of view.

A pure forward movement, with no rotation involved, seems to be rare. It takes place of course to a certain definite extent during the change from deciduous molars to premolar teeth, but the slightest hitch in this process is evidenced by rotation of the permanent molars as will be shown later.

A2. Prolonged Retention of Deciduous Canines.

If the upper permanent canine does not take up its position in the arch at the proper time, soon after the eruption of the premolars, the permanent molars take advantage of the extra room provided by the spacing of the premolars and rotate in a medio-lingual direction (Fig. 5). The deciduous canine does not preserve sufficient space for its broader successor and the latter will be unable to find room in the arch unless the rotation of the molars is corrected and the premolars given space to move distally. It is of course possible that

rotation in these cases may have occurred earlier, and have been associated with some other factor also.



FIGS. 3 & 4.—Twins. Rotation following early loss of deciduous molars. Medical Research Council.

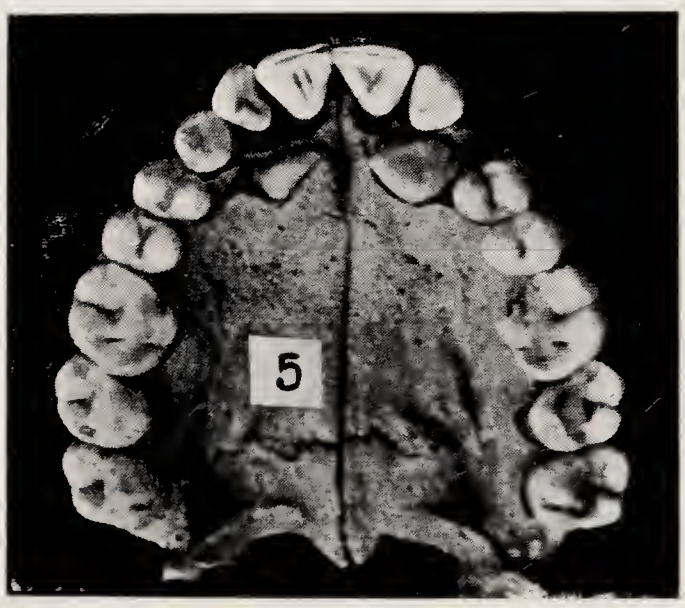


FIG. 5.—Rotation associated with retention of deciduous canines. Saxon skull from Bidford, No. 56. John Humphries Museum, Birmingham.

A3. Abnormality in Shape or Size of the Premolars. Congenital Absence of Teeth.

The variations or total loss of contact points which result from any of these conditions will affect the movements of the permanent molars in a similar way to that shown in the foregoing cases, but the movement will occur at an earlier stage of development (Fig. 6).

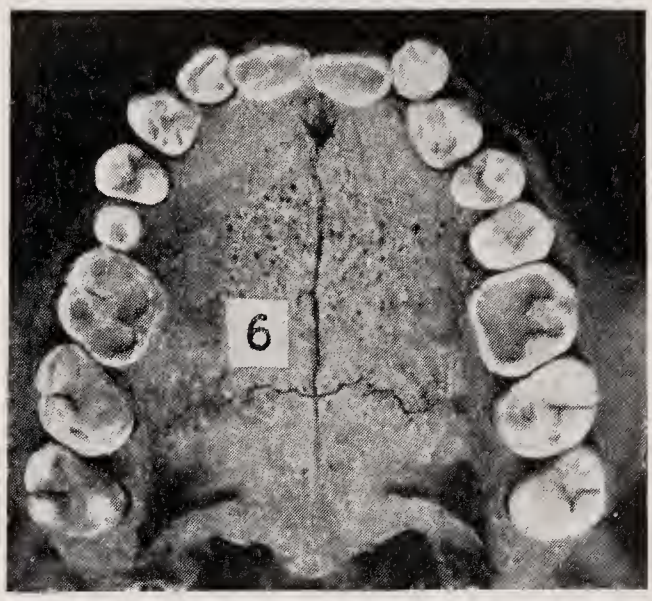


FIG. 6.—Rotation associated with abnormally small premolar. Saxon skull from Bidford, No. 107. John Humphries Museum, Birmingham.

From all the foregoing types of rotation a general impression would be gathered that the chief factor in the causation of such rotations is the presence of an abnormal space medial to the permanent molars. Also, that the almost inevitable encroachment on such space is the result of nature's effort to close the abnormal gap, brought about by a modification of her normal process of growth. But before leaving this section I must mention a reference to the subject made by Dr. Sim Wallace [6]. He states :—

" The factor which determines whether a tooth will move forward is not so much the available space in front of it, as the available space behind it." Also : " The question as to whether or how much the molars will move forward hangs altogether on whether the jaws before the time of extraction had grown sufficiently to accommodate them without pressure of the molars behind." This brings in another important factor, and helps to explain those cases in which, although the deciduous molars have been lost rather earlier than they should, there is no undue forward movement. Presumably in these cases there has been ample bone growth behind the first molars so that there is no pressure transmitted through them. At the same time, the forward movement can hardly depend entirely on this, as if there were no spaces in the arch the pressure from the developing molar region would be transmitted through it as a whole, and the molars would not be able to move individually. The space in front of the tooth undoubtedly provides the opportunity for rotation.

Dr. Sim Wallace does not mention rotation as a form of forward movement after extraction, but some of his illustrations show it well. His Fig. 51 shows a marked rotation of the left upper first molar, due to the shifting round of the teeth caused by the absence of the lateral incisor of the opposite side. It is remarkable that the teeth on the same side as the extraction are much less affected than those on the other side. The latter are all progressively further forward than the corresponding teeth on the right side.

B. Partial or complete absence of forward movement of lower deciduous teeth in relation to upper deciduous teeth before the age of 8 years.

The whole subject of the changes that occur in occlusion between the ages of 3 and 8 years has been dealt with very fully by Dr. Friel in various papers [7, 8]. The points that I wish to bring out here cannot be understood without detailed references to these changes, therefore Dr. Friel has allowed me to make use of his diagrams to illustrate them.

At 3 years of age the occlusion of the deciduous teeth, if in normal relationship, is quite definite. The triangular ridge of the medio-buccal cusp of the upper second deciduous molar fits closely into the medio-buccal groove of the lower second deciduous molar; the oblique ridge into the disto-buccal groove, and the well-marked medio-lingual cusp is received into the cup-shaped central fossa of the lower tooth. The relationship of the distal borders of these two teeth with this occlusion is of the greatest importance in connection with the ultimate occlusion of the permanent teeth, and it is a relationship which is capable of being somewhat misinterpreted, as the variation in expert opinions seems to show [8, 9, 10].

The crux of the discussion seems to be—Is there, or is there not, a projection of the upper second deciduous molar distally beyond the lower second deciduous molar, which guides the upper permanent molars into their correct occlusion?

In the first place, it is impossible to judge by examining the mouth with a mirror only, as the angle at which the mirror is held will affect one's judgment. Secondly, bad models are worse than useless, as the distal borders are the most likely to be distorted. And lastly, the angle at which the models are viewed alters the apparent relationship of the parts. They should be looked at at right angles to the line of the arch as this passes along the buccal surfaces of the teeth, and not obliquely. If these points are borne in mind, the majority of cases in which no forward movement has taken place will be seen to show that those points on the distal borders of the deciduous molars which form, or will form, the contacts with the permanent molars, upper and lower, are in the same vertical plane. In a great many cases there is actually a projection of the upper tooth beyond the lower, but on closer investigation this usually proves to be the bulge of the disto-lingual cusp, which will fit the disto-lingually sloping medial surface of the upper first permanent molar, and which is placed lingually to the contact point.

It is the relationship *at the contact points* between deciduous and permanent molars, both upper and lower, which is the essential point.

Taking the upper contact point first, the anatomy of the adjacent surfaces must be considered. The distal surface of the deciduous molar has a bulge below the disto-lingual cusp which is not in contact with the permanent tooth at all; the smaller bulge below the disto-buccal cusp should form the point of contact, meeting the corresponding bulge below the medio-buccal cusp of the permanent molar. This point is placed approximately at the end of the buccal third of the total length of the medial surface of the latter tooth. The surfaces of the two teeth should be parallel, and sloping disto-lingually.

The corresponding relations of the lower teeth differ somewhat. The medial surface of the permanent molar has only a slight convexity, and in general direction lies at right angles to the line of the arch. The distal surface of the deciduous molar is rather variable,

with the variations in size and position of the distal cusp. This cusp forms the contact point, which normally is placed almost at the buccal angle of each tooth.

Taking a case where no forward movement of the lower teeth has occurred up to the time of the full eruption of the permanent molars—if the medial surfaces of the upper and lower molars, when in occlusion, are superimposed, and their contact points with the second deciduous molars, as described, are also shown, it can be seen that the upper and lower contact points are lying in the same vertical plane; they almost coincide, at the point of intersection of the lines representing the medial surfaces of the upper and lower teeth (Figs. 7 and 8).

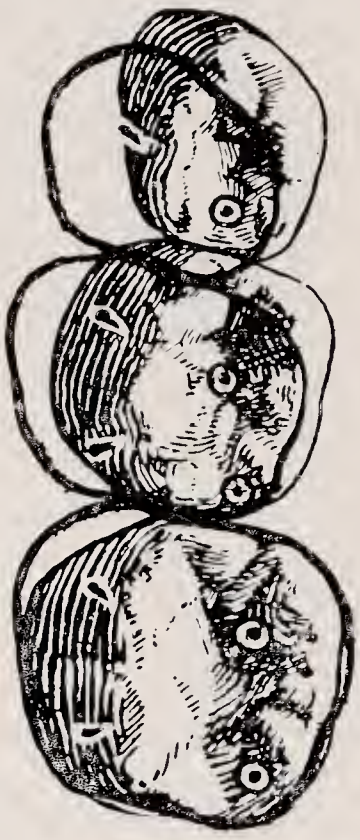


Fig. 7. Fig. 8.

FIG. 7.—Drawing of the lower teeth (Fig. 17A) placed in supposed correct line with the outlines and points of cusps of upper teeth in morphologically normal occlusion of deciduous teeth, showing relationship of distal surfaces of upper and lower deciduous molars.

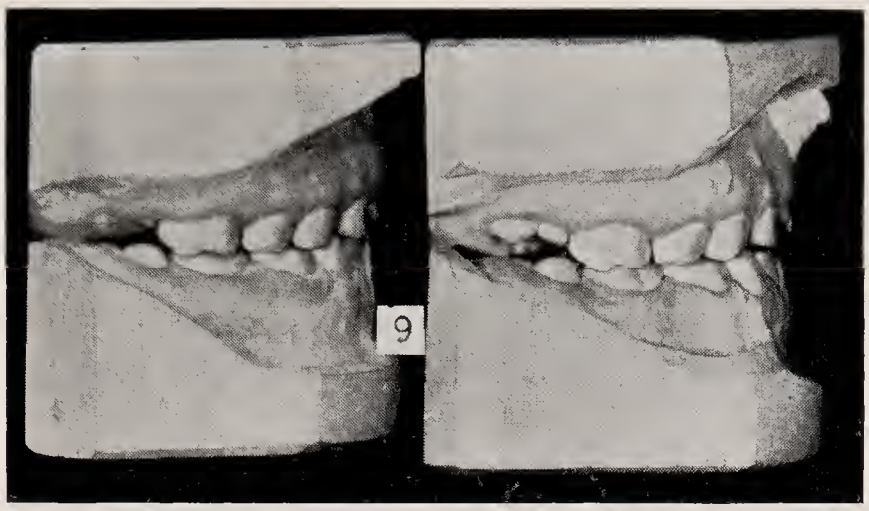
FIG. 8.—The above wording (Fig. 7) is applicable to Fig. 8 in relation to Fig. 12A.

Bearing in mind the morphology of the permanent molars, it is obvious that normal occlusion of these teeth cannot be attained under these conditions. A cusp-to-cusp contact only is possible. The diagrams referred to in References (Friel 8) at end show this condition, and also two other rearrangements which may take place.

(1) The medial surfaces of the permanent molars are flush, that is to say, their contact points are in the same vertical plane. The upper molar is correct in position, but the distal position of its antagonist will not allow of correct occlusion. If this condition persists there is marked wear of the cusps. More often there is one of the following adaptations to gain a greater functional efficiency.

(2) Shows a bodily distal movement of the upper molar, so that it may reach occlusion with the lower. This does not seem a likely solution of the problem, as it is contrary to the direction of

normal movement and growth, and clinically it is rare to find a space between deciduous and permanent molars, if the deciduous arch is unbroken.



FIGS. 9 & 10.—Erupting first permanent molar, showing medio-lingual cusp at lowest level. Medical Research Council.

(3) Shows the most common condition which is the result of insufficient forward movement of the lower teeth, namely, a rotation of the upper permanent molar. This tooth in the course of its development and eruption goes through various changes in position and direction, as is well known. Its earlier positions will be described elsewhere. The main point here is that, as the tooth actually comes into occlusion, the well-marked medio-lingual cusp is the most inferior portion, and is the first part to touch its antagonist. (Fig. 9 and 10). Normally it should drop straight into the central fossa of the lower molar, but if there is an abnormal antero-posterior relationship, this cusp will strike instead some point medial to this. In a slightly postnormal case this point will be the sloping edge of the cup-shaped fossa, and the cusp will be guided down into its proper occlusal position, or very close to it. But, in making this movement, the tooth must rotate in order to allow of the adjustment. The medio-buccal cusp travels in a medio-lingual direction, the contact point moving towards the centre of the distal surface of the deciduous tooth. The whole of the occlusion of the permanent molars is thrown out, and also the upper tooth now takes up more

space in the arch than it should, by reason of a diameter greater than the true medio-distal diameter now lying in the line of the arch (Figs. 11, 12, 13, 14, 15). (Campbell's Bronze Age skull shows a similar condition to the Belfast skull [3].)

There is one solution of the problem of occlusion in these cases of non-forward movement, and that is rotation of the lower molars as well as the uppers. It is made easier if the distal cusp of the lower deciduous molar is small or absent. It is seen sometimes when the lower arch is a little narrow in the molar region, as well as being slightly postnormal. A disto-buccal rotation of the lower permanent molar ensures correct occlusion with the medio-lingually rotated upper molar, and is an example of a morphological abnormality which is nevertheless functionally normal.

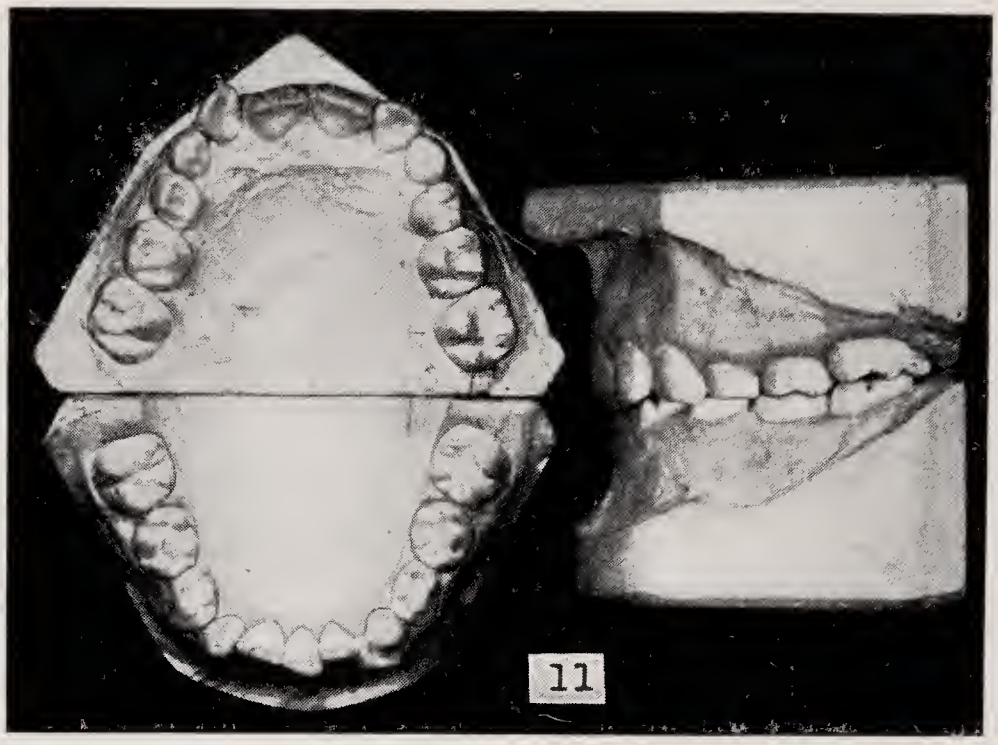


FIG. 11.—Rotation associated with non-forward movement of lower deciduous teeth.

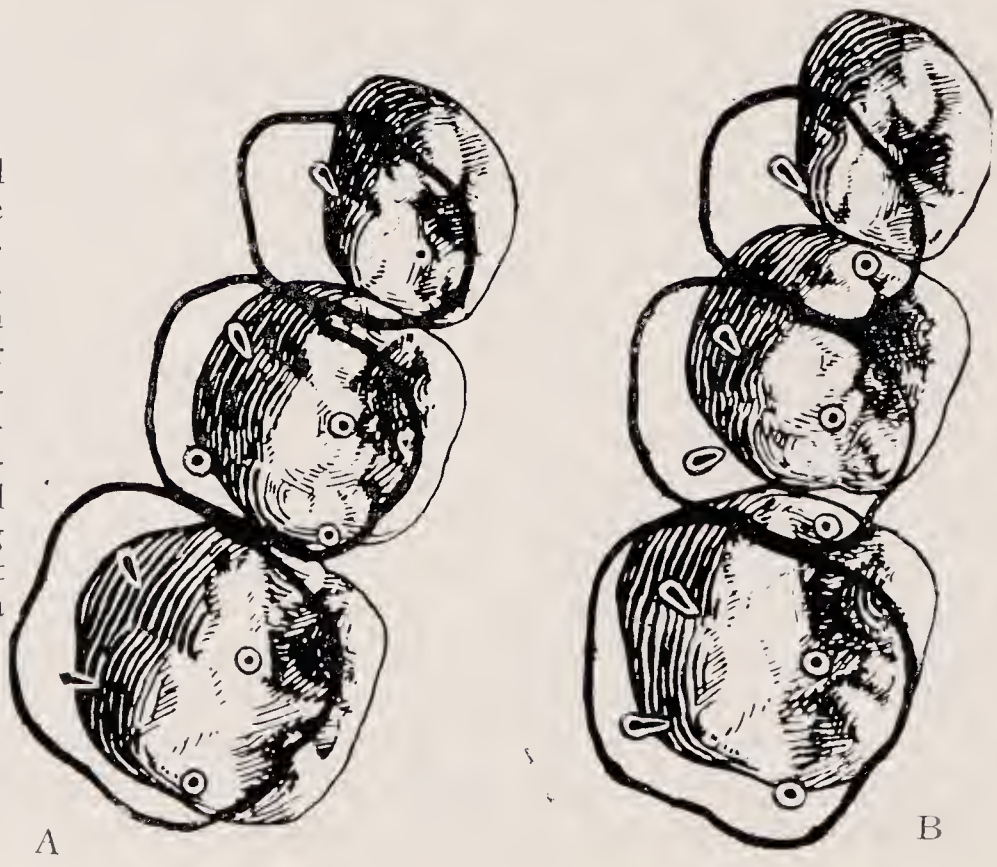


FIG. 12.—Occlusal drawing of left side of Fig. 11. (*a*) Actual conditions, showing rotation of upper and lower first permanent molars. (*b*) Reconstructed arch, morphologically normal occlusion, showing forward movement of lower teeth is a necessity

FIGS. 13 & 14.—Rotation associated with non-forward movement of lower deciduous teeth. Bronze Age Skull, Anatomical Department, The Queen's University, Belfast.

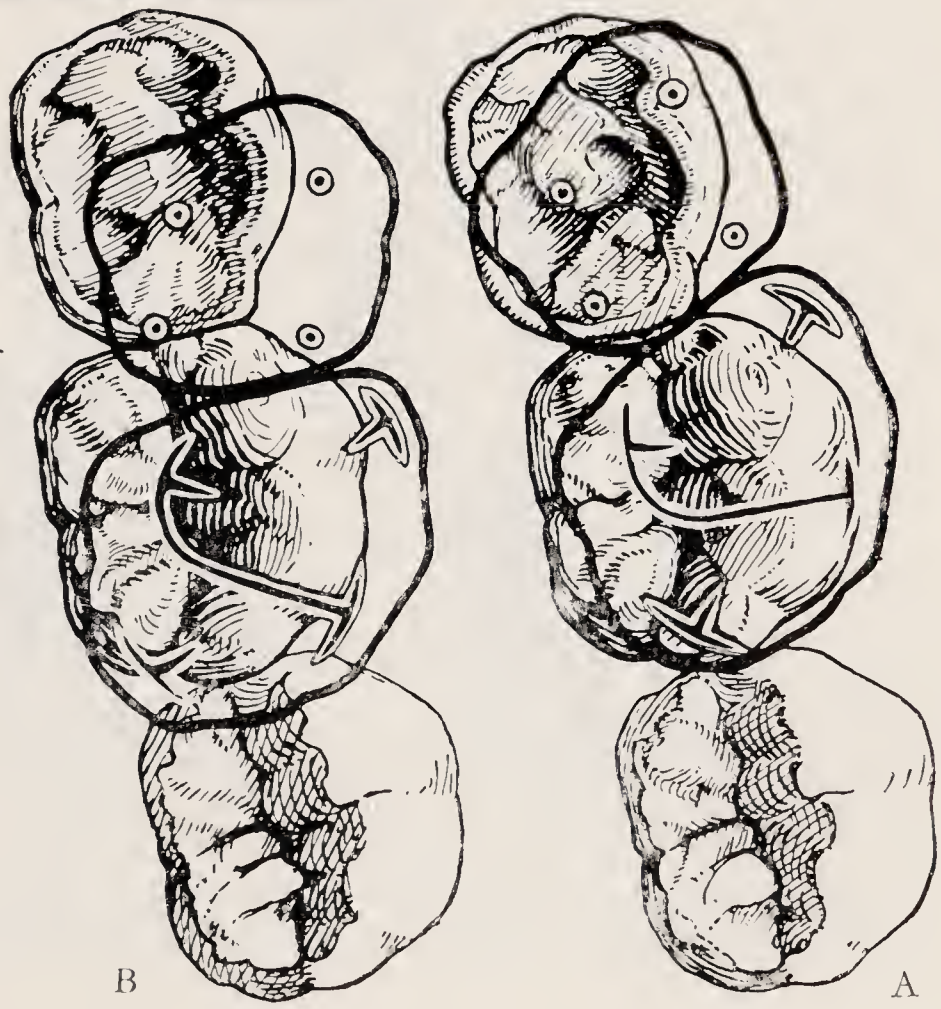


FIG. 15.—Occlusal drawing of right side of Bronze Age skull (Fig. 13). (*a*) Actual conditions, showing rotation of molars. (*b*) Reconstructed arch, morphologically normal occlusion, showing forward movement is a necessity.

C. Access of transverse growth in the upper permanent molar region at the time of the eruption of these teeth, when the deciduous arch has remained narrow.

The access of growth referred to is that spurt of lateral development which is sometimes seen associated with the eruption of the permanent molars, while the deciduous arch remains narrow as the result of some early interruption of lateral bone growth (Figs. 16, 17, 18).

FIG. 16.—Rotation associated with access of transverse growth in permanent molar region.

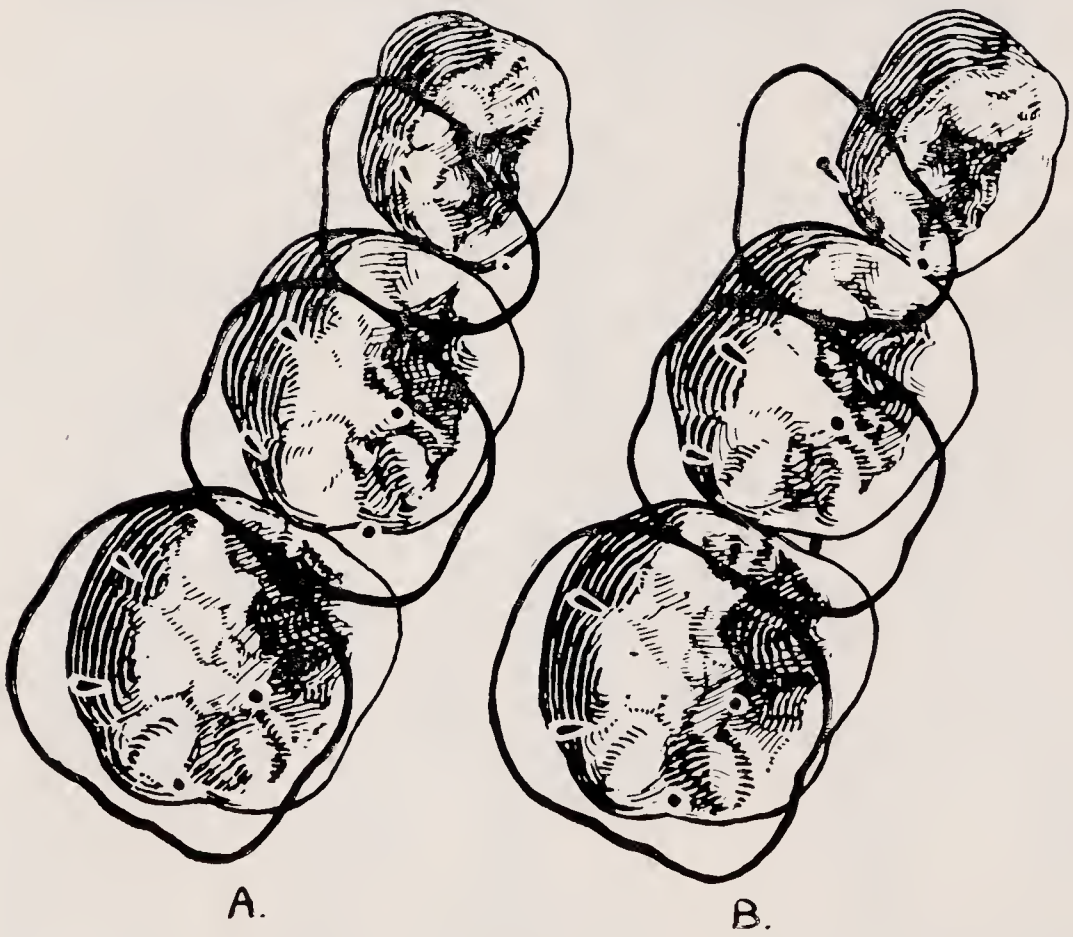


FIG. 17.—Occlusal drawing of left side of Fig. 16. (*a*) Actual conditions, showing rotation of permanent molars. (*b*) Reconstructed arch, morphologically normal occlusion.

This type of rotation is apparently disto-buccal, the centre around which rotation has actually taken place being the medio-buccal cusp. The line of the arch receives as it were a sudden bend outward, pulled by the laterally growing bone. The first permanent molar makes contact with the second deciduous molar at a point on the surface of the latter which is more buccal than normally, and touches the second deciduous molar at its disto-buccal angle. It is at this contact point that the outward bend of the line of the arch begins. It must be clearly shown, however, that although the medio-buccal cusp is the centre of rotation, it is the *disto-buccal* cusp which is the most nearly correct in position, as the medial border of the tooth is still joined to the narrow deciduous arch, and is placed too far lingually. This is of great importance in treatment.

FIG. 18.—Rotation associated with access of transverse growth in permanent molar region. Medical Research Council.

The history of a case showing similar conditions is of interest. The boy was selected for observation when he was aged 6 years 1 month, because he had regular deciduous arches and correct occlusion for 3 years, but no spacing. There was no sign of his permanent molars at that time. He was a very stupid-looking child, and lacking in vitality in every way. Measurements were taken at that time, and three months later, and the increases were negligible, if any at all. Three months later still he was remeasured, and showed an increase of 3 mm. in zygomatic breadth, and 2 mm. in bigonial breadth, other measurements showing a slighter increase, while the width of the lower deciduous arch remained stationary. At this time the permanent molars were erupting and the incisors were about to erupt. Unfortunately models were not taken, and these observations are from notes. After this third observation he was lost sight of for some time, and when seen again was 9 years old, looking much more intelligent, and bearing a report of good progress and a normal interest in work and play. There seemed to be a possible connection between the spurt of alveolar growth which is so marked and the unexpectedly noticeable improvement in general physical and mental development.

D. Interruption of transverse growth in the upper permanent molar region at the time of the eruption of these teeth, the deciduous arch being normally developed.

This condition, the converse of that just described, is sometimes associated with rotation of the upper molars in the opposite direction to that usually shown. They show a disto-lingual rotation. The deciduous arch has a normal or almost normal lateral development, but growth fails at the critical time of the eruption of the permanent molars, so that the distal borders of the latter are not carried far enough in a buccal direction, and the line of the arch is bent lingually. This may be accentuated when the molars come into occlusion, by the upper ones being forced into lingual occlusion, especially if the mandible has not suffered from the same growth-check as the maxilla, and is therefore wider than the upper arch in the molar region. This type of case is sometimes associated with postnormal relationship of the lower teeth, and this makes lingual occlusion of the upper molars more likely still, as the broadest part of the lower arch, the molar region, is opposed to that part of the upper arch which is suffering from lack of lateral growth, namely, the distal portions of the permanent molars.

E. Rotation in conformity with a V-shaped upper arch.

The V-shaped upper arch is a well-defined type of abnormality which is usually associated with some degree of postnormal occlusion of the lower arch.

The direction of rotation is medio-lingual, but at first sight this is not at all obvious, as there is no irregularity in the line of the arch, the permanent molars being in a straight line with the deciduous molars or the premolars. But the progressive narrowness from behind forwards has in fact necessitated a rotation of all the cheek teeth, and if the deciduous molars could be placed in their correct positions the rotation of the permanent molars would become apparent. This is actually what occurs if such a case is treated

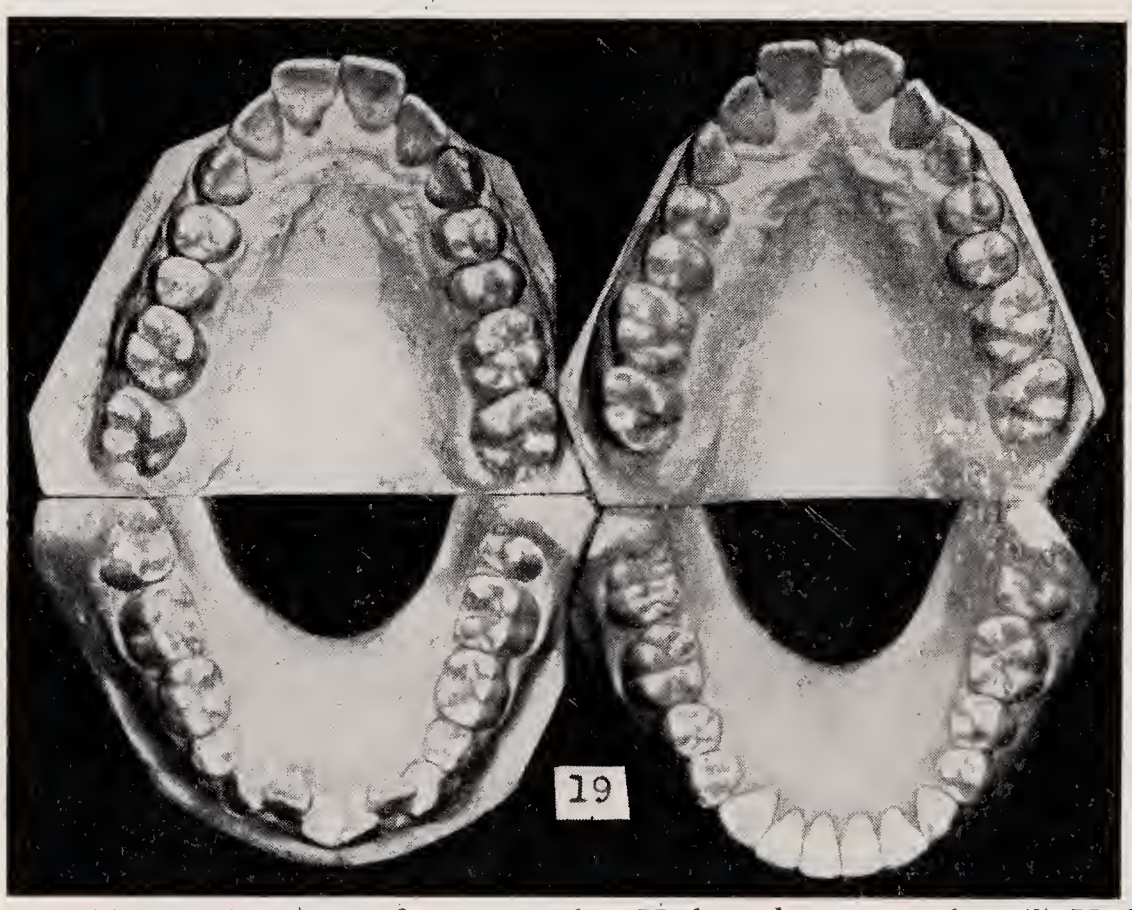


FIG. 19.—(*a*) Rotation in conformity with a V-shaped upper arch. (*b*) V-shaped upper arch, but no rotation of molar. Medical Research Council.

by expansion of the anterior part of the arch without rotation of the permanent molars, and when the postnormal relationship, if present, is corrected, it will be found to be impossible to restore normal occlusion of the molars. Abnormal rotation in postnormal cases is in this way a definite obstruction in the way of successful treatment.

In some cases of this type the permanent molars erupt in their correct positions with no abnormal rotation, and when this happens they appear to show greater abnormality than their abnormally rotated neighbours, because they do not conform to the general shape of the arch (Figs. 19, A and B).

F. Normally rotated position of upper molars in the crypts, and failure to rotate during eruption into their correct positions for normal occlusion with the lower molars.

In this section the term " rotation " is used in two senses : firstly to describe the *static position* of the teeth within the crypts—a normal condition, so far as I can tell, although there is not very conclusive evidence ; secondly, a *movement* of rotation will be described, as forming part of the eruptive activity of the permanent molars—also a normal condition, so far as the evidence goes. These meanings of the term are quite different from the sense in which it has been used previously, where abnormality has always been implied, but it did not seem possible to make use of any other term to describe the conditions referred to in the present section.

It is a well-established fact that the permanent molars undergo progressive changes in their positions and in the direction of their movement during the course of development. The combination of downward and forward movement of the upper molar—which is one kind of rotatory movement—is particularly noticeable, but another component part of development has not received so much attention. This is rotation around the long axis of the tooth. There is no doubt that this movement does take place, but the difficulty is to ascertain the exact position and amount of rotation of the molars within the crypts which may be considered normal, before any developmental movement has taken place.

Professor Brash is definitely of the opinion that this progressive rotation during development takes place, and it is well seen in the specimens of pigs' jaws on which his researches on bone growth were carried out [11]. In fact, to arrive at correct occlusion, all the molars in the pig have to rotate continuously during development and eruption.

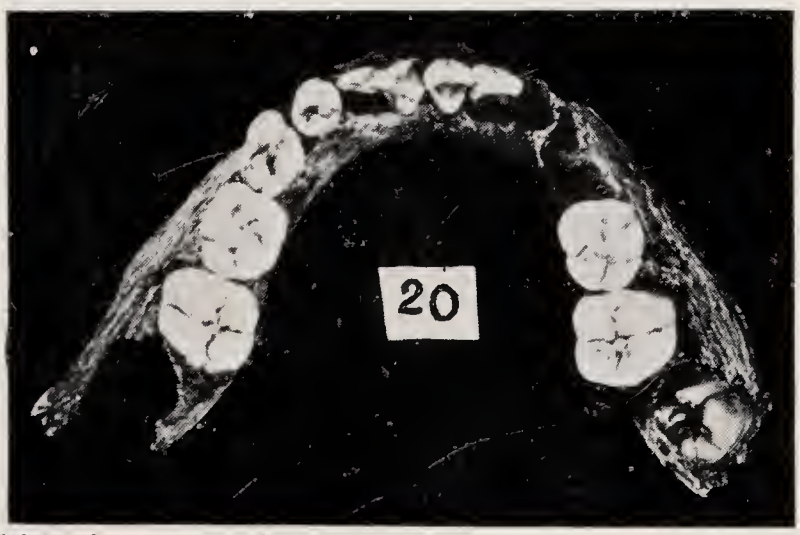


FIG. 20.—Mandible from Stratford, probably Saxon, showing static rotation of second permanent molar in crypt. John Humphries Museum, Birmingham.

The lower molars, both in the pig and in man, lie in the crypts in a position of disto-buccal rotation, and during development they describe a rotation which is a combination of disto-lingual and medio-buccal movement, mainly the former. This shows very plainly in the case of the second permanent molars, in the ancient mandible of a child of about 7 years old which is from Stratford and is probably of Saxon date (Fig. 20). It is also seen in the mandible of Dr. Menzies Campbell's case, and here is also evidence that the normal process of disto-lingual rotatory movement can go too far, and produce an over-rotation such as is shown by the left first permanent molar. This is perhaps the result of the partial impaction of this tooth, but a similar over-rotation is shown in Fig. 10. The opposite condition, however, is more often found, as would be expected; this is the result of arrest of growth, with persistence of the developmental position of rotation.

FIG. 21.—X-ray photograph of child 5 years, showing rotation of upper right first permanent molar in crypt. No rotation on left side. Anatomical Dept., Trinity College, Dublin.

The upper molars of the pig lie in a position of disto-lingual rotation, and have to describe a movement of disto-buccal rotation to reach correct occlusion. Professor Brash would have expected a similar condition to characterise man's molars, and Dr. Schwarz of Vienna also describes the normal developmental position of the upper permanent molar as having its buccal surface facing disto-buccally. It was impossible to settle this point on the many young skulls of the Bidford collection, as the teeth were either rattling about loose in the crypts, or had been stuck in with doubtful accuracy, and there was no definite conformation of the crypts themselves showing the rotation, as there is in the case of the mandible just shown. Fig. 21 shows an X-ray photograph of permanent molars still in their crypts. It can be seen that the medial outline of the pulp chamber is rotated medio-lingually on one side and not on the other. Dr. Schwarz kindly lent me two X-ray photographs showing the first permanent molars still in their crypts. The age of the specimens is not stated. On one side the upper first permanent molar is slightly rotated medio-lingually, and on the other side there is apparently no rotation. From this point the evidence is based on observation of very early stages of eruption, and so far as it goes that evidence is strongly in favour of the presence of a *position* of medio-lingual rotation, normally, while the upper permanent molar is still within the walls of the crypt. During eruption there should be a medio-buccal *movement* of rotation in order to bring about normal relations with the lower molar.

FIG. 22.—Dr. A. Martin Schwarz, " Der heutige Stand der Orthodontie hinsichtlich Prophylaxe und Frübehandlung, Scheffs Handbuch der Zahnheilkunde, Neuausgabe Pichler, Band V, 1930."

When all the movements during development are considered together as one, the process may be said to resemble the path of a cork-screw, the well-marked medio-lingual cusp of the upper molar being the guiding point. The direction is downwards, forwards and inwards. This adjustment for normal occlusion is a very delicate one, and it can only be carried out completely if all the surrounding parts are in strictly normal conditions. It would be reasonable to suppose that any slight growth check would interfere with these movements, or that any mechanical obstruction, such as slightly postnormal occlusion of the lower teeth, would prevent their completion. In such cases a greater or lesser degree of its developmental position of rotation in a medio-lingual direction remains after the upper molar is fully erupted.

This type of rotation, therefore, is the result of an arrest of development locally, and may be the only evidence of failure of full growth. It is usually associated with other more or less slight evidences, such as insufficient forward movement, or close bite, and it is only when the case is seen just before the molars are in occlusion that this persistence of developmental rotation can definitely be cited as a factor. Normally the medial cusps of the upper molars should be exactly prepared to occlude correctly with the lower molars just before they actually come in contact with each other; if developmental rotation of one of the opposing pair persists this is not so, and whether or not correct occlusion will ever be attained is an open question. If non-forward movement is a co-factor, it is certain that the rotation will persist, as the medio-lingual cusp is held in its position by its occlusion with the lower tooth. But if lack of full eruption rotation is the only symptom of arrest of growth, it is possible that the final full contact with the lower molar, if this tooth is in correct position, will provide the stimulus for completion of the normal movement of the upper molar.

Confirmation of this progressive developmental rotation may be found in the parallel case of the rotation which the upper lateral incisors have to undergo in order to reach their positions in the arch. Their developmental positions are very clearly shown in the

illustrations of Professor West's paper [12]. It is also interesting to remember how frequently these teeth erupt in their earlier developmental relationship to their neighbours if there has not been sufficient alveolar growth to complete their full normal movements.

Diagnosis and Treatment.

In the diagnosis of rotations of molars it must be borne in mind that the term "rotation" is a relative one. Like many other problems of orthodontia, this condition has no fixed or definite standard of normality. Each case has its own norm in this one particular which is in harmony with the normal general form of the arches for that case. There are as many variations within the normal for this one character as there are for the size and shape of the arches of different individuals, or for the shapes of the teeth themselves. Therefore it is as impossible to give a definite answer to the question, "What is a rotated molar?" as it is to define a normal arch.

The simplest way to see the variations in position is to represent the upper molars by quadrilateral outlines, and then to select some base line, as constant as possible, by which the relative positions can be tested. The most convenient is a line at right angles to the median raphe. This may be drawn behind the molars, and in normal cases will pass through the most distal points of both teeth. If one molar has moved forward more than the other the line will touch only the more distally placed tooth, and will indicate the difference in movement (Fig. 1). Lines may be drawn parallel to the base line at any point in the arch, and, provided the median raphe is not distorted, will be a valuable guide. A line drawn through the medio-buccal angle of one of the molars, if it does not pass through the corresponding point of the other molar, will reveal which tooth is rotated, and how much more room in the arch it is taking up than its fellow. Such calculations can be made with exactitude on careful drawings, but it is not practicable to do this with every case which comes up for diagnosis. A reasonably accurate idea can be obtained, however, with the aid of a symmetroscope in studying the models. Even without this the eye quickly becomes trained to detect abnormalities of this type, especially if the backs of the models are cut parallel to the base line referred to. The correct trimming of models in this way is of the greatest help in diagnosis.

Another useful test is to prolong the line of the buccal wall of the upper molar until it intersects the base line behind, and shows its relationship to the line of the arch in front. If the molar is rotated this line will cut the line of the arch (if this is normal otherwise), and will intersect the base line at too acute an angle.

These tests are all made on the upper model, and reveal only abnormalities in relationship to the rest of the upper arch. More important still are the relationships with the lower arch—the occlusion with the lower molar. A detailed study of the models is the most satisfactory method of diagnosis, but an accurate knowledge of the ideal conditions is required. These relations have been referred to at length in the section on rotation due to non-forward movement.

The cutting out of the centre of the lower models gives a much better view of the lingual relations, which are of the utmost importance in diagnosing not only abnormal rotations, but any form of malocclusion.

A rough test which can be done in a moment in the mouth is to get the patient to bite hard into a piece of soft composition placed between the molars. When hard, the impression can be pierced by a sharp probe at the tips of the cusps of the upper molars, and the reverse side will show if they occlude in their correct positions. All tests of occlusion for abnormal rotation of upper molars depend on whether the lower molar itself is normal. It does not vary nearly so much as the upper, and its position is easier to judge by eye, the two lingual cusps being normally in a straight line with the lingual cusps of the deciduous molars.

Having decided that abnormal rotation of one or more molars is a symptom of a certain case, it is necessary to try and ascertain to which ætiological class it belongs. Treatment must be based on this.

Generally speaking, the centre of the movement of the rotation treatment should be as nearly as possible the same as the centre of the abnormal movement has been, the direction being of course reversed. In the appliance [13], this centre is represented by a short round vertical tube soldered to a band on the molar to be treated, parallel to its long axis, at a point as near to the true centre of rotation as possible. Into these tubes fit the right angle ends of a lingual bar, held in place by latches. The bands can rotate freely round the vertical ends of the bar. The force is supplied by springs which are soldered to the disto-lingual corners of the bands and brought round, lingually, to a point about opposite the first deciduous molars or premolars, where they are curled securely around the lingual bar. The ends must be fixed so that they cannot slip off the bar, but loosely, so that the spring can slide along the bar when the band is rotated (Fig. 23). The spring is of the "beam" type, the action of which was explained fully by Mr. McKeag in his paper last year [14]. Both ends are trying to straighten out, but the distal end being fixed to the band, which can only rotate, the desired movement in a disto-lingual and medio-buccal direction is obtained. The appliance is sprung into place, and a state of constant tension is maintained.

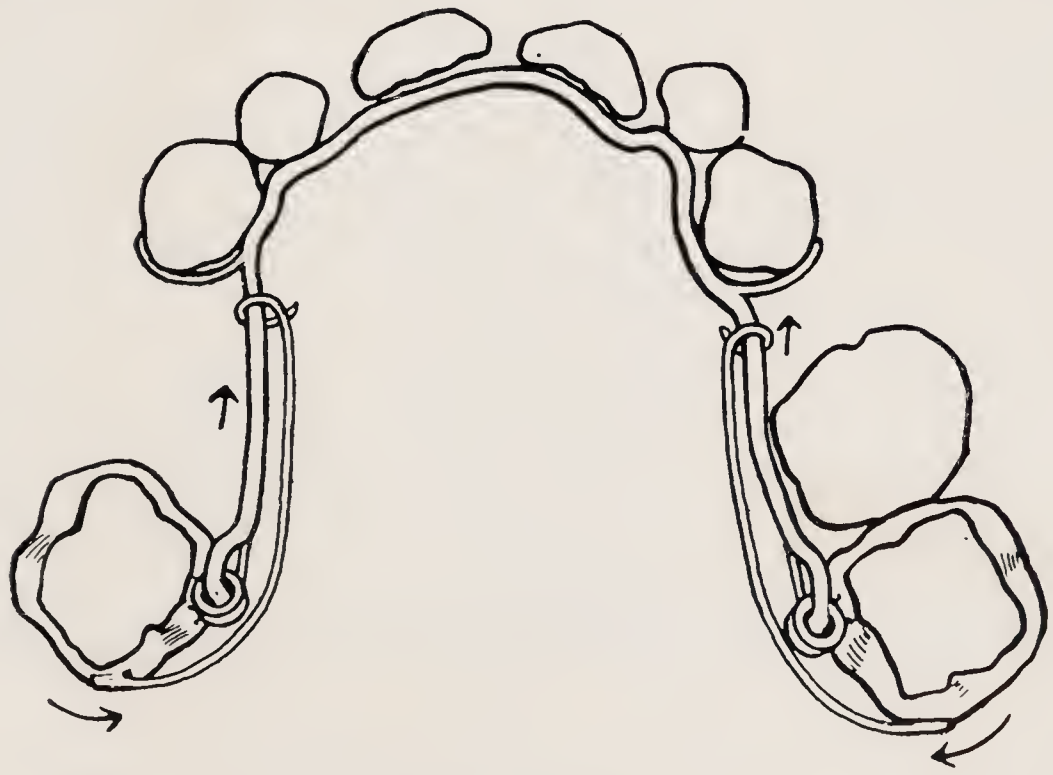


FIG. 23.—Rotation appliance. Showing rotation springs and spurs to counteract forward thrust.

The reaction of these springs must always be carefully considered when planning an appliance. The reaction is forwards and inwards on each side. In a double rotation the inward or lingual components of the reaction of the two springs counterbalance each other, but the forward pressures combine, and are a force to be reckoned with. This reaction can sometimes be made to serve a useful purpose.

The principles of the appliance described can be applied to any case of medio-lingual or disto-buccal rotation, with special adaptations for the ætiological class to which it belongs.

A. Local factors—premature loss of deciduous teeth, etc.

In these cases the main object of treatment is to regain the maximum amount of room for the premolar and canine teeth by rotation. If there is little bodily movement the prognosis is good, however severe the rotation may be (Fig. 24).

Where there is a space medial to the molar, the reaction of the rotation spring can be most usefully employed. A spur soldered to the lingual arch, touching the first deciduous molar or premolar distally, will take the forward thrust, not only preventing the molar from moving forward as well as rotating, but also keeping the other tooth from drifting away from its medial neighbour. Spurs of this type, placed distal to deciduous molars or canines, or premolars are always advisable when it is important to gain room in front of the molars which are being rotated. The force of the reaction is surprisingly great; it will sometimes be sufficient to move a lingually placed upper incisor outside the lower teeth, when the overbite is not too deep.

In cases of congenital absence of teeth the necessity for treatment only arises if the occlusal relations show such abnormality that it is obvious that rotation of the molars would improve function.

B. Lack of forward movement.

The main object here is to correct occlusal relations. If the deciduous arch is unbroken there is no danger of lack of space for the premolars. In these cases it must be remembered that if the lower teeth remain in their postnormal position, the result of rotating the upper permanent molars into correct position will be to bring about one or other of the conditions shown in Dr. Friel's occlusal diagrams previously referred to, which is of no advantage unless combined with the correct amount of forward movement of the lower teeth. Therefore this should be encouraged at the same time. If necessary the cusps of the deciduous teeth should be ground down. This may not be sufficient, and the appropriate treatment for inferior postnormal arch relationship should not be delayed (Fig. 25).

C. Access of transverse growth.

Here the required movement is really a medio-buccal rotation, and to obtain this the same appliance can be utilised, in conjunction with a buccal expansion from a U-shaped loop in the lingual arch. This not only moves the medial cusps of the molars buccally, but at the same time provides the means for the expansion of the deciduous arch which is necessary.

D. Interruption of transverse growth.

These cases require the opposite kind of rotation to all the others described, namely, a disto-buccal movement. This can be brought about by a lingual arch, the ends of which lie in horizontal tubes soldered to the molar bands; the ends of the arch are bent outward

from the point where they enter the tubes, and the arch sprung into position. If the whole of the posterior part of the arch is too narrow, a U-shaped loop can be used.

E. V-shaped arch.

Lateral expansion is always necessary in cases of this type, and can be performed by auxiliary springs soldered to the bar of the rotation appliance. Their reactions, like the lingual part of the rotation spring reaction, cancel each other. If the case is postnormal, and there is protrusion of the upper incisors, the bar should be away from these teeth, so that the reaction of the rotation springs does not tend to increase the protrusion. If, on the contrary, the incisors are inclined lingually, the bar should fit closely to their cervical margins, and should carry auxiliary springs to correct this inclination.

I have attempted in this paper to show the working of the many factors that may lead to abnormal rotation of the first permanent molars in particular, with special reference to the injury to the normal development of the denture that this condition may produce. The

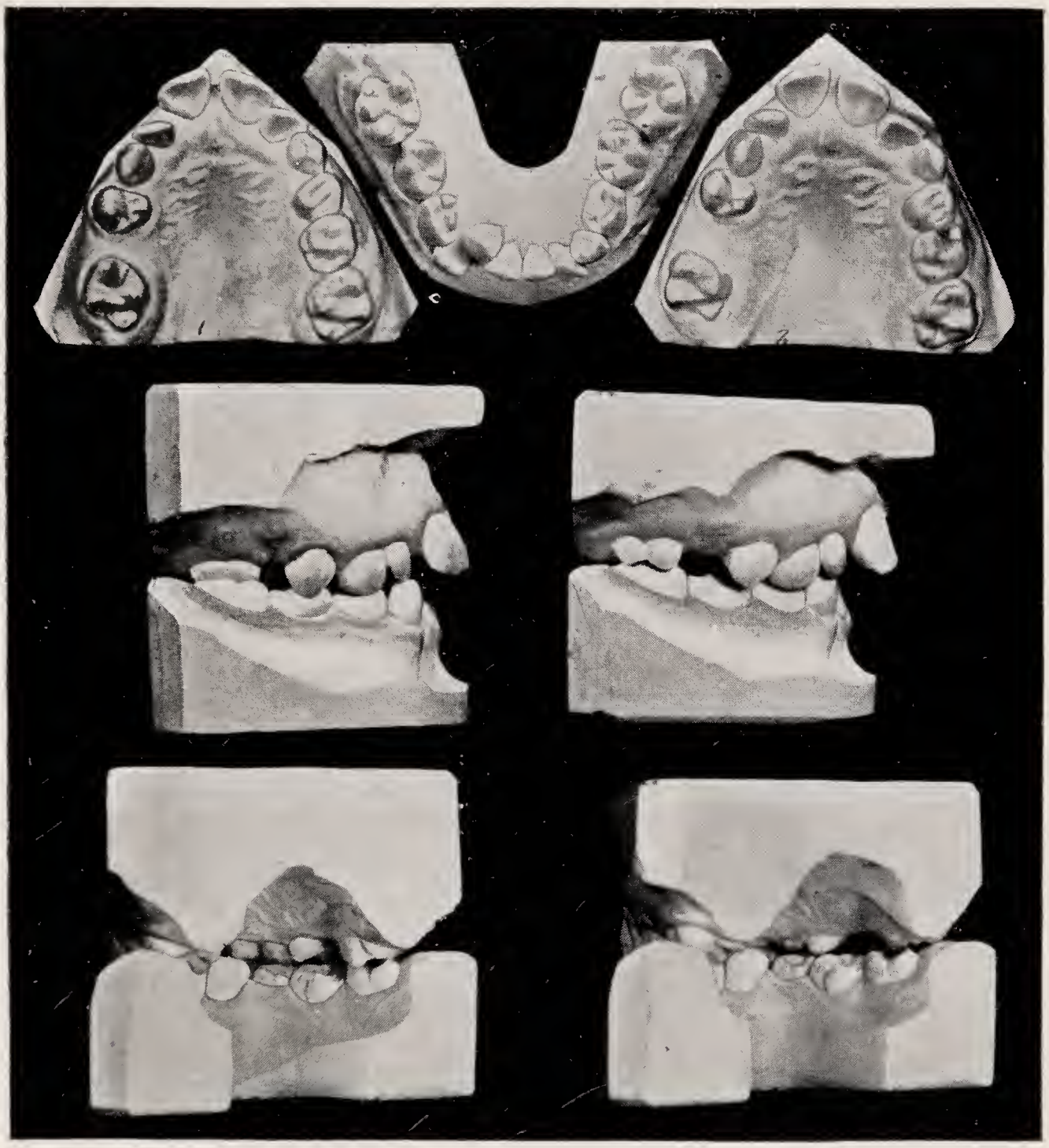


FIG. 24.—(*a*) Rotation of molars due to premature loss of deciduous molars. (*b*) Molars rotated, note amount of space gained for second premolar, and restoration of normal occlusion.

FIG. 25.—Case treated by rotation and lateral expansion. (*a*) Before treatment. (*b*) After treatment.

treatment of rotation has been briefly reviewed, and it appears, from the examples shown, that the results obtained have materially assisted in the general orthodontic treatment of these cases.

I am greatly indebted to Professor Brash for his advice and assistance, and for the use of the skulls in the John Humphries Museum, Birmingham; to Dr. Sheldon Friel for his help and the loan of his models and diagrams; to Dr. Menzies Campbell and Professor Walmsley for the slides of the Bronze Age skulls; to Mr. Northcroft for the use of models for reference; to Sir Frank Colyer for the loan of a slide of a specimen in the museum of the Royal College of Surgeons; to Dr. Schwarz of Vienna for advice and the loan of photographs; and to Miss P. Wilson for the drawing of the diagrams.

My thanks are also due to the Medical Research Council for allowing me to use material collected during my work for the Dental Committee.

REFERENCES.

[1] HELLMAN, MILO, "An Interpretation of Angle's Classification of Malocclusion of the Teeth Supported by Evidence from Comparative Anatomy and Evolution," *Dental Cosmos,* Vol. LXII, 1920, p. 476.

[2] TURNER, J. G., "The Movements of Teeth in Relation to Daily Practice," *British Dental Journal,* Vol. XLV, 1924, p. 57.

[3] CAMPBELL, J. MENZIES, "Notes on the Dentitions of Three Bronze Age Skeletons," *British Dental Journal,* Vol. XLIX, 1928, p. 658.

[4] "Report of the Nomenclature Committee of the British Society for the Study of Orthodontics." Trans. British Society for the Study of Orthodontics, 1927.

[5] BERNARD, CLAUDE, "Experimental Medicine," p. 83. Translated by Henry Copley Greene, New York, 1927.

[6] WALLACE, J. SIM, "Variations in the Form of the Jaws," p. 195, 197, London, 1927.

[7] FRIEL, SHELDON, "Occlusion: Its Development from Infancy to Old Age." Trans. First International Orthodontic Congress, 1926, p. 138.

[8] FRIEL, SHELDON, "The Relation of Function to the Size and Form of the Jaws." Proceedings Royal Society of Medicine, Section of Odontology, Vol. XXII, 1929, p. 53.

[9] NORTHCROFT, G., "Twenty Years After." Presidential Address. Trans. British Society for the Study of Orthodontics, 1929.

[10] SCHWARZ, A. M., "Die Einstellung der Sechs-jahr-molären hinter dem Milchgebiss." *Zeitschrift für Stomatologie,* 1927, Vol. XXV, p. 401, 627.

[11] BRASH, J. C., "The Growth of the Alveolar Bone and its Relation to the Movements of the Teeth, including Eruption." Trans. British Society for the Study of Orthodontics, 1926.

[12] WEST, C., "The Development of the Gums and their Relationship to the Deciduous Teeth in the Human Fœtus." Trans. British Society for the Study of Orthodontics, Vol. XV, 1925.

[13] FRIEL, SHELDON, "Rotation of Molars." Trans. British Society for the Study of Orthodontics, 1927.

[14] MCKEAG, H. T. A., "Physical Laws and the Design of Orthodontic Appliance." Trans. British Society for the Study of Orthodontics, 1929.

Discussion.

The President, in opening the discussion, said that the society had been favoured with a comprehensive study of the anatomy and physiology and pathology of the molars and the molar occlusions. The paper was a tribute to the amount of care and of acute observation which the author had given to the study of the subject.

Dr. S. Friel thanked Miss Smyth for her excellent paper. It was a remarkable fact that so few references had been made in orthodontic literature to this subject, considering the injury which the condition did to the development of the denture. Moreover, it was not a new condition, as the young skulls of the Bronze Age and the Saxon skulls had demonstrated. The treatment of abnormal rotation of molars was a most satisfactory operation, especially in those cases which were due to premature loss of deciduous teeth. The opening of spaces which were partially closed was always difficult, and if one was able to obtain 3 or 4 mm. space by rotating the molars it was a great advantage.

Miss Smyth had stressed the point that one must consider the forward reaction of the auxiliary spring. In those cases due to premature loss of deciduous teeth if one did not put on spurs engaging the distal surface of the tooth medial to the space, the molar would rotate round the medio-buccal cusp, the medio-lingual cusp coming forward and though one had a rotated molar one gained no extra space. The time of treatment of cases of inferior post-normal arch relationship was reduced if one first rotated the upper molars, and partial relapses were less frequent. Previously when the lower arch was brought forward and the molars not rotated and one had the buccal cusps apparently correct, the medio-lingual cusp of the upper first molar came in contact with the distal wall of the central fossa, and this was an unstable position. There are two other points which are rather controversial. One of these was the interpretation of the term "normal." Miss Smyth had used the term in a morphological sense, and the speaker thought that was the only sense in which it could be used for the diagnosis of malocclusion of molars and premolars. The teeth occupied rather a unique place in the body. They were the only part of the body which was completely formed—so far as the crowns were concerned—long before they came into a functional state. In every other part of the body, the bones for instance, the part was influenced by environment and the exercise of function from birth to maturity. In the case of the teeth the environment had little or no effect, and the exercise of function had none at all. The teeth were very like two component parts turned out by a Ford factory, ready made to fit. He did not think that the occlusion of the molars and premolars could be reduced to any mensurable figure. Hellman in a paper in 1921 on the subject of occlusion tried to find a biometrical normal for occlusion and to reduce it to mensurable figures. He gave the value of a unit to each contact of a cusp with groove, etc., and altogether found 138 contacts in ideal occlusion. Now he examined a series of normal skulls and found that the average number of contacts was 124, with a standard deviation of 8. Therefore a skull with 116 or one with 132 contacts was within the range of normality. The number of contacts for the incisors and canines was twelve. Thus there was ample scope for having the incisors and canines as malplaced as one pleased and for them still to be within the range of normality. He did not think that Hellman's scheme was at all suitable. If one took another case where there was a slight inferior post-normal arch relationship, all the contacts would be wrong and completely outside the range of normality and yet functionally it would be almost perfect. When one considers that Hellman's biometrical normal was based on the examination of selected skulls, what would be the standard deviation if it had been a true biometrical normal founded on nonselected cases whose only qualification was that they had the requisite number of teeth and were at the same stage of development? In the nomenclature committee's report of this society he was of the opinion that the definition of normal occlusion was wrong in principle and wording. The definition was given as that occlusion which is within the standard deviations from the ideal. Standard deviations were found from the average by a mathematical formula, so that the average and the ideal must be the same thing, but in actual fact they were not the same thing. He would suggest that the definition of normal occlusion should be based on a morphological standard for the molars and premolars, and on a biometrical standard for the overlap of the upper incisors over the lower. There was no

morphological mark to show how much the upper incisors should overlap the lower incisors, but this could be reduced to measurements. He would further suggest that the society should re-form its Nomenclature Committee, which should be given the task of examining the previous report, and of reporting to the Second International Orthodontic Congress. There is one other point, namely, as to the flush end of the second deciduous molars. Miss Smyth had made the matter very much clearer, and from her reconstructed drawings it was seen that at the contact points the second deciduous molars lay in the same vertical plane. He thought the society owed a debt of gratitude to Miss Smyth for her painstaking investigation.

Mr. H. C. VISICK desired to ask Miss Smyth whether she intended in the paper to give any reasons why the molars should rotate. He had read the paper before coming to the meeting, but he could see no reason given for the rotation of the upper molars medio-lingually. If she had no reason to suggest, he would like to put forward the view that the rotation depended rather on the position of the apices of the roots. A case had been mentioned to the society in which the four second temporary molars had been extracted at $3\frac{1}{2}$ or 4 years of age, and the four permanent molars had travelled forward and completely filled up the space, but in that case there was very little rotation. He thought the explanation why there was almost no rotation was because the roots had not been formed. Those four permanent molars were travelling forwards between the age of four and six, and at that age the apices of the roots had not formed. On the other hand if the molars moved forward after the apices were fully formed, it became a tilting movement—the tooth hanging as it were from its apices. As the apex of the palatine root was distal to the apex of the anterior buccal root, the movement has to be inward as well as forward—giving an appearance of rotation.

Mr. G. NORTHCROFT said he wanted to congratulate the author on the presentation of her paper. He wished that all slides shown at the meetings of the society were half as good. In spite of their number, they did not bore one to look at. He did not know whether it was due to Miss Smyth's ingenuity that the base of the lower models had been cut out which admitted light on the lingual surfaces. That was an idea which he would certainly adopt. The speaker happened to be the chairman of the Nomenclature Committee which had been mentioned by Dr. Friel. The committee prepared its report for the first International Orthodontic Congress, and he himself fought tooth and nail for the term "ideal" without "normal" being introduced as the term to describe what had always been called normal occlusion. It was not normal occlusion, but it was ideal occlusion, and people were just now beginning to find that what he had contended for during the work of the Nomenclature Committee was the correct view after all. The present author had used the term "ideal normal"; she could not go quite the "whole hog" and say "ideal," she had to drag in the normal somewhere. For his own part he would welcome a second Nomenclature Committee for the second International Orthodontic Congress, the idea being that that committee should correct the errors of its predecessor, but it must have a different chairman.

With regard to the second point of controversy on which Dr. Friel had spoken, he might divulge the secret that Miss Smyth and himself were engaged on an investigation into the occlusion of a series of children from three to five years of age, and they hoped finally to dispose of this knotty question after viewing a hundred or so models. The models would be brought before the society, and members could take their choice. He might be wrong in his contention, or it was just possible, on the other hand, that Dr. Friel might be wrong, but he hoped that this matter would be decided to everybody's satisfaction in the course of the next year.

Mr. H. G. WATKIN said that Dr. Friel had given the society a good deal of information on rotation movements last year, and he for his own part had learned quite a lot from that evening's paper. One thing on which he must congratulate Miss Smyth was that she used the terms of the Nomenclature Committee exclusively. He never heard her say "six-year molars" once!

Sir NORMAN BENNETT said that he had been very much impressed by Miss Smyth's paper; it had left his mind not entirely clear, but he had learned more in an hour about this subject than he had gathered for a long time. He supposed that the most frequent cause for forward movement of the molars

was the loss of the second deciduous molar. Mr. Visick had asked Miss Smyth and the meeting to explain what was the reason why the rotation was usually medio-lingual. The speaker had always assumed that it was due to the resistance of the long palatine root. If they knew what it was that moved the molar forward they might know better why it moved in a particular direction. Did anybody know what made the molar move forward ? He thought not. They were in the habit of calling it growth. They knew that if they opposed the resistance of a canine to the resistance of a molar and put equal pressure on the two, it was probably the molar that would move and not the canine ; the canine would not move at all. A canine, so far as resistance went, was more than equal to the molar. It might be assumed, therefore, that it was length of root which was more important than anything else in this respect. If that was so, it was easy to understand that it was the resistance of the long palatine root which prevented the translational movement of the molar, and therefore the rotation was medio-lingual.

Mr. HAROLD CHAPMAN said, with reference to the etiology of molar rotations, that in some cases under treatment for enlargement of the arches, it had been his experience that he had a loss of space while treating the case. He thought there was some inherent tendency for small arches to remain small, and as soon as there was a chance for anything to go wrong, such as a space to close slightly, or a molar to rotate a little, that event occurred. He said, with reference to treatment, it had occurred to him that, instead of curling the spring round the arch, the free end of the spring could be made into a loop which engaged a spur directed medially on the arch. He had not tried it himself, but it seemed to him a very simple method of fixation. He had been specially pleased to notice that Miss Smyth gave some idea of the normal position of a permanent molar, from the point of view of rotation ; this information had so far been lacking. Miss Smyth had spoken of a forward thrust ; he asked how that forward thrust came about.

SIR NORMAN BENNETT said that he thought he could reply to Mr. Chapman's last question, for the answer seemed to him obvious. There was a gain in spacing, the molar tooth moving backwards, chiefly on the buccal aspect. At any rate, there was a rotation backwards around the palatine root. If a tooth moved backwards it was because there was a force pushing it in that direction, and therefore there must be an equal and opposite thrust forwards.

Mrs. LINDSAY desired to add her congratulations to those already voiced to Miss Smyth for a very admirable piece of work. As Mr. Northcroft and Mr. Chapman had absolutely clamoured for records, they ought now to be glowing with satisfaction at the mass of records in this paper. It was very seldom that the question of the developmental position of the first permanent molars was properly considered. If these were taken at the age of nine months the distance between the upper first permanent molars in the tuberosities was 21 mm. ; the distance between the lower first permanent molars in the roots of the coronoid processes, was 38 mm., and the distance between the first temporary molar and the first permanent molar in the upper jaw was 6 mm. and in the lower jaw 11 mm. Therefore the lower molar was 5 mm. behind the upper, and 8.5 mm. outside of it. Those relations were quite extraordinary when the distance the molars had to travel was considered, and it was not to be wondered at that very often what was called post-normal occlusion resulted. The occlusal surfaces of the upper and lower molars were also opposed to each other, the upper molar being inclined buccally downward and backward, and the lower molar forward, outward and slightly inward. They were facing each other and, she supposed, hoping to meet in six years' time. Sir Norman Bennett had already spoken about how they met eventually, but she thought that if a student who did not know anything about development came upon this paper he might imagine that the teeth were something like marbles in a pat of butter, growing down towards each other. Were the teeth passive objects or active objects ? Was it the bone that moved the teeth or were the teeth moving in the bone ? Both, of course. Mr. Lindsay had once suggested the analogy of a moving staircase on the Tube, the teeth being moved into position as a result of the movement of the " staircase," but possibly also themselves walking up the staircase and so arriving more quickly into position. The whole question was very complicated and obscure, but the subject was a very fascinating one and one which she hoped would never be solved, because half

the interest of the study would in that case be gone. She congratulated Miss Smyth on the great amount of care shown in the preparation of her paper.

Mr. NORMAN GRAY desired to express his appreciation of the paper. Every contribution which Miss Smyth had made to the proceedings of the Society had been well worth study. When he was in Philadelphia, Dr. Johnson urged him to study the rotation of the molars, saying that he would find it an aid to diagnosis. Miss Smyth had done a valuable piece of work in drawing attention again to this phenomenon, because it did help tremendously to notice this particular feature and it also simplified treatment a good deal. When he asked Dr. Johnson about the application of biological principles, and suggested that he should give him a concrete case, Dr. Johnson replied that he thought the rotation of the molars was a big point. There were cases where a simple appliance could rotate the molars and save a great deal of treatment, perhaps even intermaxillary treatment, if the case could be got at a certain age.

Mr. R. LINDSAY said that if none of the other protagonists of orthodontic practice were prepared to continue the discussion, he would like to add his own tribute to the excellence of Miss Smyth's work and to make a confession. He had been inclined on first seeing the paper to wonder whether the question, "Is it worth while?" might not have been placed in front of it, and, certainly, even after reading the first part of her paper, he was still inclined to ask that question. But when he heard her read the paper and saw her demonstration of those very excellent slides, he came to the conclusion that it must be worth while, and that the rotation of the permanent molar might be a very essential and important element of treatment in orthodontics. When looking at the Bronze Age skulls, he was inclined to think that particularly the adults were out of place in this series, because, so far as he could make out, the rotation which was shown in the teeth in many of those adult skulls was really due to the movement involved in heavy mastication performed by those teeth. Not only had the masticating surfaces been worn down, but the contact points had been destroyed and had become contact surfaces, and in the course of this excessive exercise there had been rotation movements in many of the teeth. In that respect the author had not got much support from her slides, but he thought all present would admit that she did get thorough support when she went on to deal with the young cases where the development in the erupting permanent molar was shown. It appeared to be a sign of the times that a woman should have used a corkscrew as an instrument in the elucidation of these cases, but he doubted whether the movement of the corkscrew did actually show the path of the developing tooth. With regard to the question of the forward push of the upper molars, as Mrs. Lindsay had just said, it showed that the tendency of the growth was downwards and backwards. That, indeed, must be evident from the development of the mandible.

Miss SMYTH, in replying to the discussion, thanked the Society most heartily for the reception given to her paper. Any time she had spent on its preparation had been much more than repaid. She herself had not put so much value on this work as some speakers appeared to do. The first point that Dr. Friel had referred to was the forward reaction of the springs. A thing that came into her mind was a remark of Mr. McKeag's in his paper, which he had also tried to instil into her personally—that to every action there was an equal and opposite reaction, and that applied to the spring which figured in her illustrations. But it was rather an unusual type of spring, because it was fixed at one end and sliding at the other. It slid forward on the bar, so that part of its reaction was lost, but it tended to thrust forward, and the forward movement was assisted by the natural forward movement of the molar. As to the question asked by Mr. Visick why molars moved forwards, she could not say the reason why molars moved forward, any more than she could give the cause of eruption, but there seemed to be an inherent tendency in teeth to rotate. She did not know whether it was begging the question to bring in heredity, which was a sort of scape-goat for everything about which there was uncertainty. There did seem to be a tendency to rotate whenever the normal conditions were interfered with. She was interested in what Mr. Visick had said as to one of the factors influencing rotation being the length of the roots of the teeth, and she thought that the amount of formation of the lingual roots in particular must have a great deal to do with the stability of the teeth. The case which she had shown first of all moved through the bone at an early stage when there was no

anchorage by the roots. With regard to nomenclature, she thought the Nomenclature Committee might also do something as regards rotations. She had used the term "medio-lingual" and "medio-buccal" and so on, but these terms could not always have been clear, and she often found it very difficult herself to apportion the right term to the movement that she wished to describe. That would be a necessary task for a Nomenclature Committee. Mr. Visick had also said that she had talked so much more about upper rotation than about lower rotation. Lower rotations were fairly common, she had shown one or two, and there were others included in the models shown on the table. Most of the rotations in the lower were in the disto-buccal direction, which was the developmental direction of that tooth, and showed the persistence of the developmental rotation. Over-rotation was not so common. Mr. Northcroft had mentioned the cutting of the models ; but it was not her own idea. She thought that the cutting of the models in that way enabled one to see the lingual relationships better, the importance of which had been stressed by Dr. Schwarz, of Vienna. She was interested in Mr. Chapman's device for anchoring the spring. She had only that day been dealing with a spring which had come uncurled, whereas when one wanted to uncurl them it was a thing they stubbornly refused to do. Mrs. Lindsay had interested her by her remarks on the developmental positions of the teeth. She felt that a whole paper might be read on the developmental position of the teeth, and she could only touch on the merest fringe of the subject. But just at the last moment before completing her paper, she had received the interesting X-ray picture from Dr. Schwartz who had been working on the same point, and she felt inspired to find out some more about the developmental position of the molars. Dr. Schwarz in his essay spoke of the "urge" of the teeth to meet one another, and the phrase recalled itself to her when she heard Mrs. Lindsay speak of the teeth which "hoped to meet later on." The teeth were not just hung up in the blue, so to speak, they had a definite mission in life to meet each other. She had been extremely gratified by the remarks of Mr. Lindsay that it was worth while from the practical point of view to undertake this work. If one treated a post-normal case showing abnormal rotation of molars without rotating them, and a similar case in conjunction with rotation, one was no longer in doubt that rotation was worth while. With regard to the ancient skulls, she quite agreed that in a great many of these cases the factor which had helped to bring about rotation was wear and not occlusal conditions, but one or two of the examples were definitely associated with abnormality in the shape of the other teeth.

A vote of thanks was accorded to Miss Smyth by acclamation.

CASES IN PRACTICE.*

By Harold Chapman, L.D.S.

Case No. 40. Class III.—Lower incisors well in advance of upper incisors.

Age 1.5.—Treatment started with elastic force acting from a head cap, made by the mother to an aluminium chin cap. No models at this period.

Models 40 (*Fig.* 1). *Age* 1.9.—Lower incisors almost in contact with upper incisors.

Models 40*a* (*Figs. 2a and b*). *Age* 2.5.—Lower incisors in contact with upper incisors ; the latter have probably been pushed lingually by the lower teeth as there is considerable overbite.

The case had been in this condition several months ; it was thought that the overbite prevented correction, so a lower vulcanite plate was inserted at this time ; the plate covered the lower molars and opened the bite so that there was no overlap ; it was also made to press $\overline{21 \mid 12}$ lingually. Ten days after the plate had been put in the incisor relations were correct, and it was discarded.

* Given at a Demonstration Meeting of the Society, May 5th, 1930.

Models 40*c* (*Figs. 3a, b and c*). *Age* 2.10.—Arch-relationship normal.
Fig. 4.—The head cap (made by the mother).
Fig. 5.—The aluminium chin cap.
Fig. 6.—The lower plate.

Mr. Harold Chapman also showed a chair-side bookshelf. The shelf is attached to an arm 12 in. long, such as is used to carry a bracket table; the arm is placed on the spindle of the chair attachment which carries the spittoon. There are actually two mahogany shelves connected by side pieces. The upper shelf is $15\frac{1}{2}$ in. by $7\frac{3}{4}$ in.; the other is $5\frac{1}{2}$ in. lower and $\frac{3}{4}$ in. narrower; there is a small beading round both shelves. The plate connecting the shelf and the bracket is placed nearer one end of the shelf than the other to facilitate its coming into a more convenient position.

Mr. Harold Chapman also showed a silver wire thumb or finger guard used to prevent thumb sucking. The guard was brought to the notice of the writer by Dr. Wm. A. Crosby of New Haven, Conn., U.S.A.

THREE CASES AND THEIR TREATMENT.*

By G. F. Cale Matthews, L.D.S.

I was not able to conform at the time to the Hon. Secretary's request to bring forward any cases that were causing particular difficulty—I had not time to get them ready—but on the very day on which his request came, three cases passed through my hands, and whatever you may feel when you have seen them, I think you will agree that I had a particularly happy day.

The first is a child of 8 years and 5 months with bilateral post-normal occlusion. I show the case corrected. I would point out the marked depth of the first premolar development. I am more and more convinced in the cases of post-normal occlusion that the first premolar is the most important tooth in maintaining normality.

The second is a case of normal occlusion in relation to the first permanent molar. I show the case after thirteen months' treatment. Patient aged 16 years.

The final case is one of post-normal occlusion. The earlier models, taken in March, 1925, were sent with the patient. I show them and, for comparison, the later models. Patient aged 8 years.

(Mr. Cale Matthews' short communication was illustrated by a large number of models and slides.)

Discussion.

The President said that members would have seen with great pleasure the beautiful results that Mr. Cale Matthews had been able to obtain. He would like to ask whether, in obtaining these results, he had made use of force applied in such a manner as to move the teeth in a tilting direction, rather than in the manner which he would describe as a root-moving direction—in other words, whether his force applied to the crowns of the teeth had moved the crowns first in the hope that the roots and the bone supporting those roots would move afterwards, or whether he had moved the teeth in a direction parallel to the long axis of the whole of the teeth. The question was a difficult one to frame, but he thought Mr. Cale Matthews would understand his meaning.

Mr. H. G. Watkin asked whether Mr. Cale Matthews had used any intermaxillary elastics in any of these cases.

* *Transactions* of the Society, May 5th, 1930.

Fig. 1

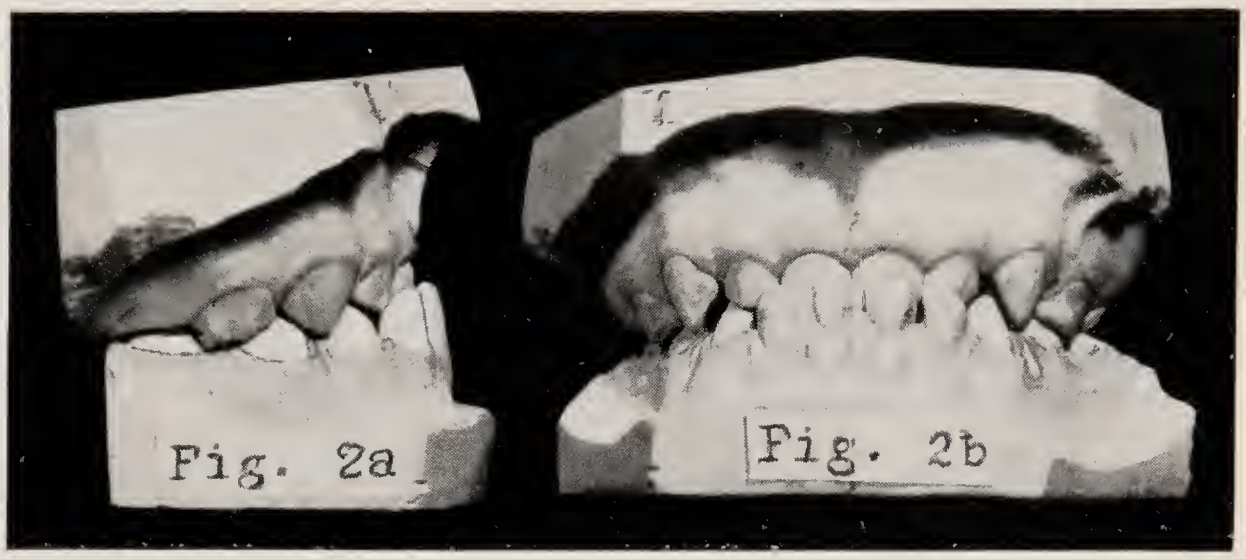


Fig. 2a

Fig. 2b

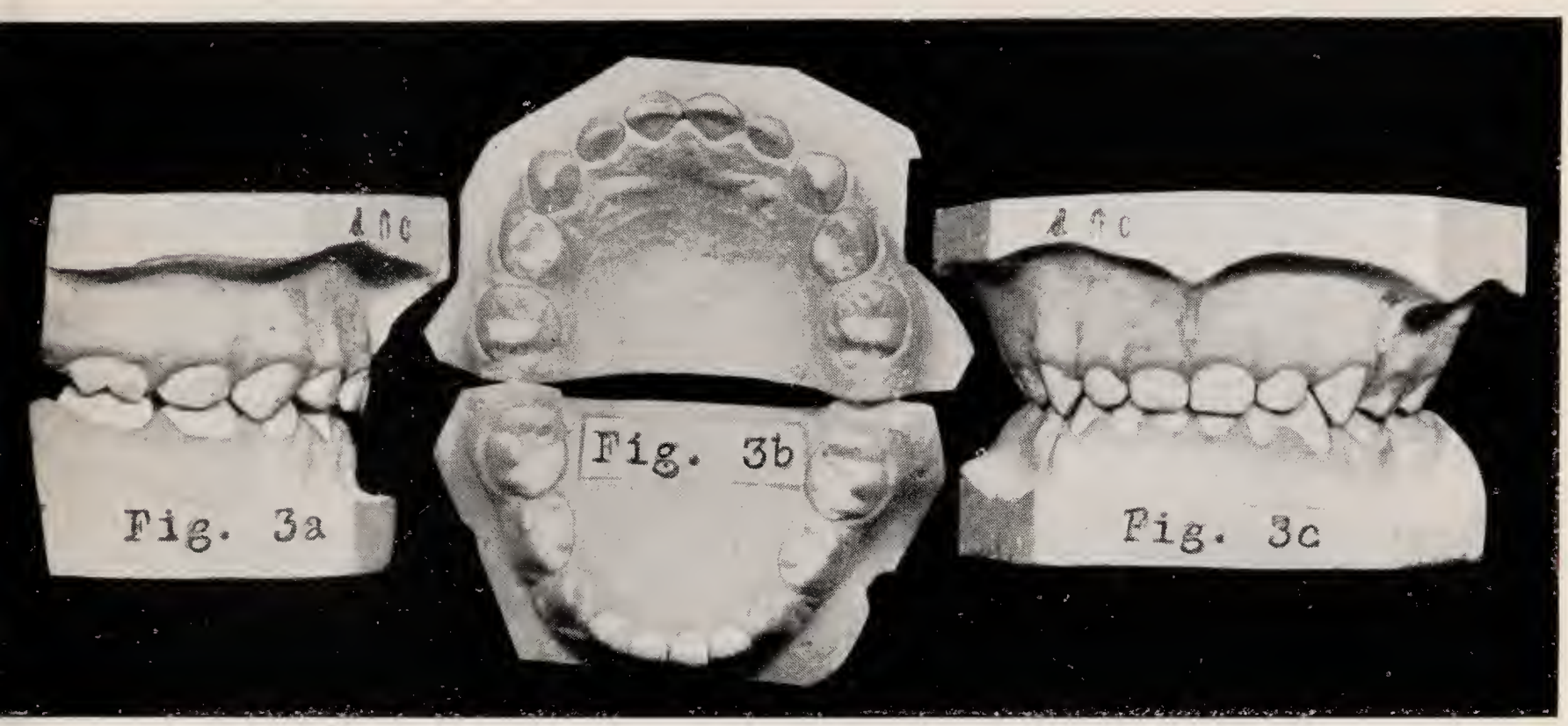


Fig. 3a

Fig. 3b

Fig. 3c

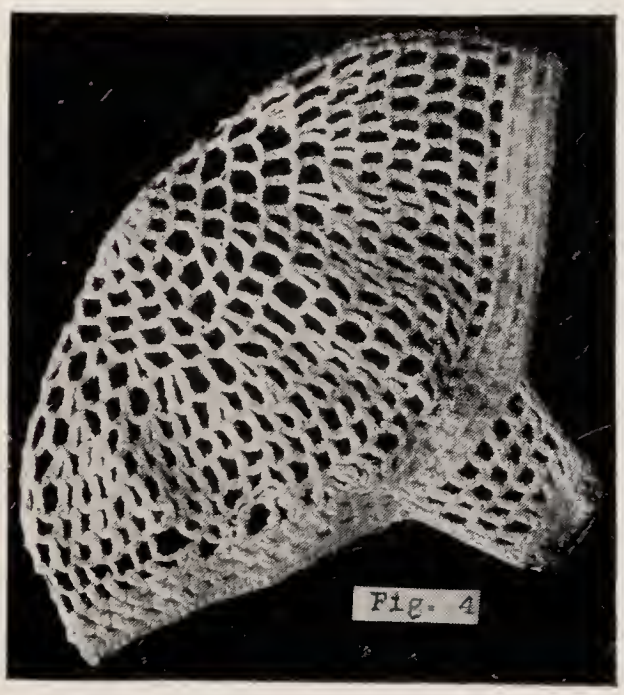


Fig. 4

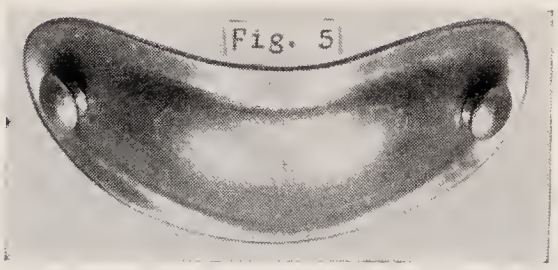


Fig. 5

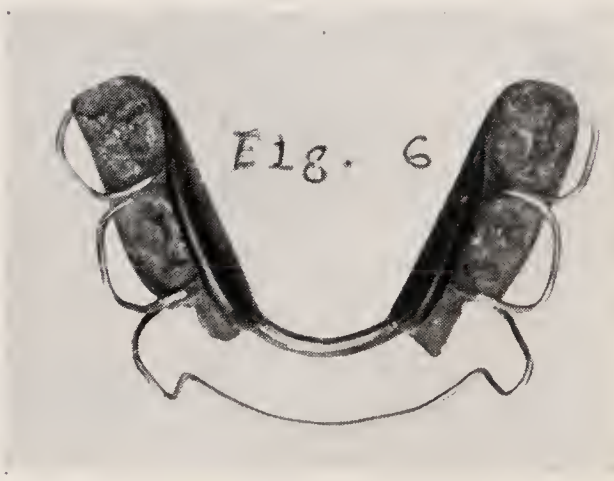


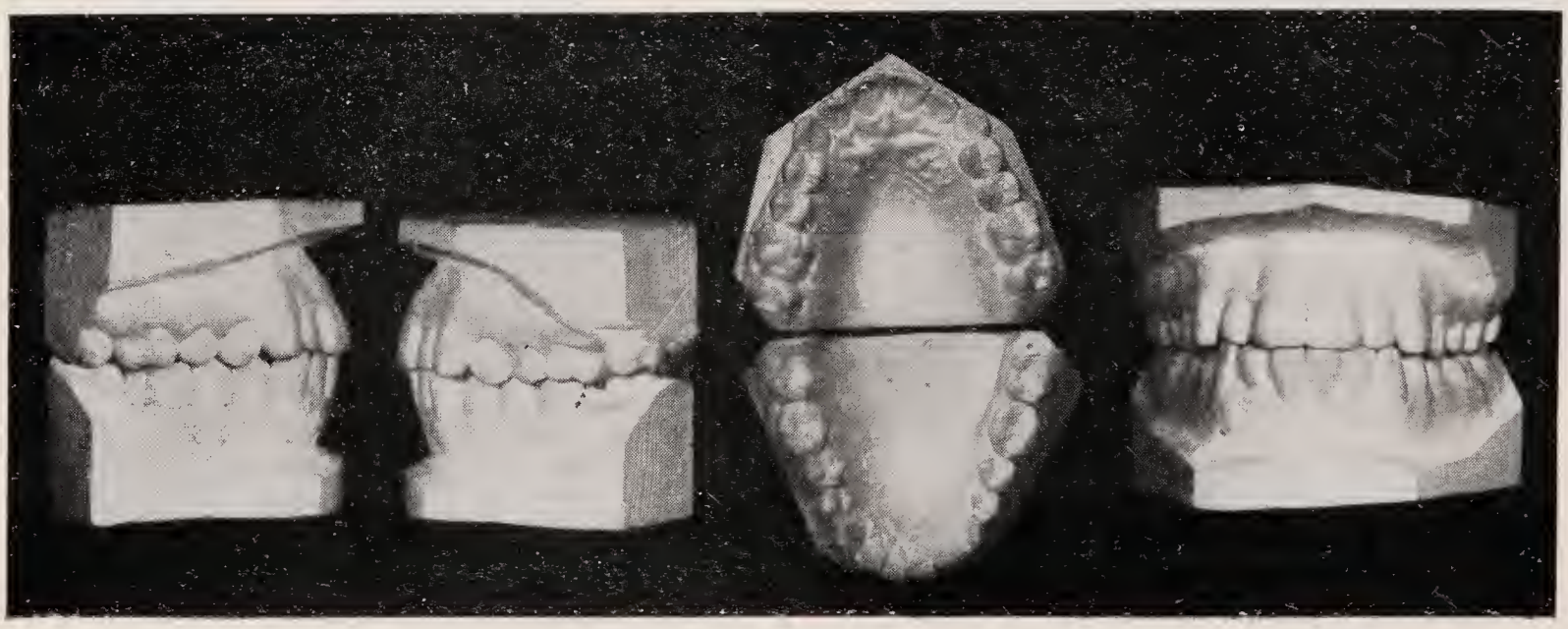
Fig. 6

Illustrating Mr. Harold Chapman's Communication.

Age 8 years 5 months. Age 10 years 8 months, Sept., 1930.

Note forward movement of mandible. No intermaxillary traction. Treatment to allow vertical growth to correct occlusion of posterior teeth.

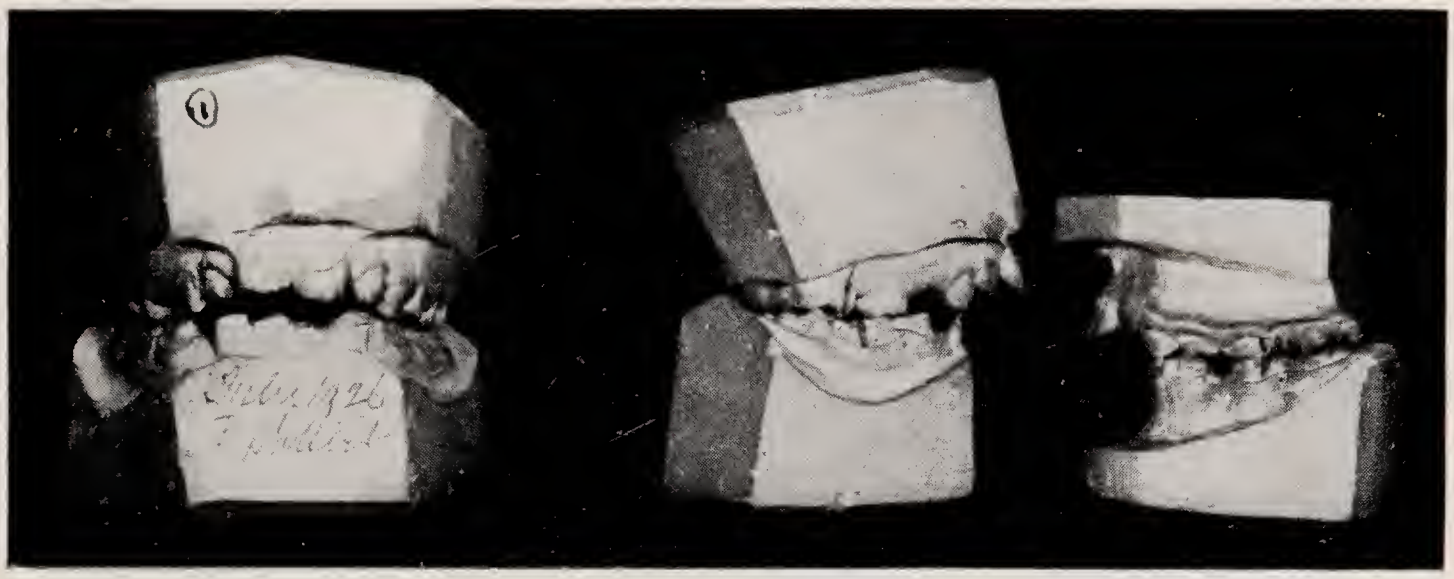
Second case, age 16 years.



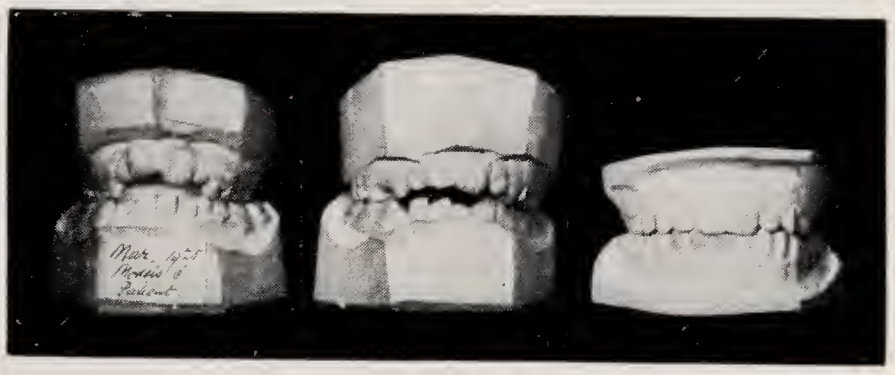
Illustrating Mr. Cale Matthews' Communication.

CASES IN PRACTICE.

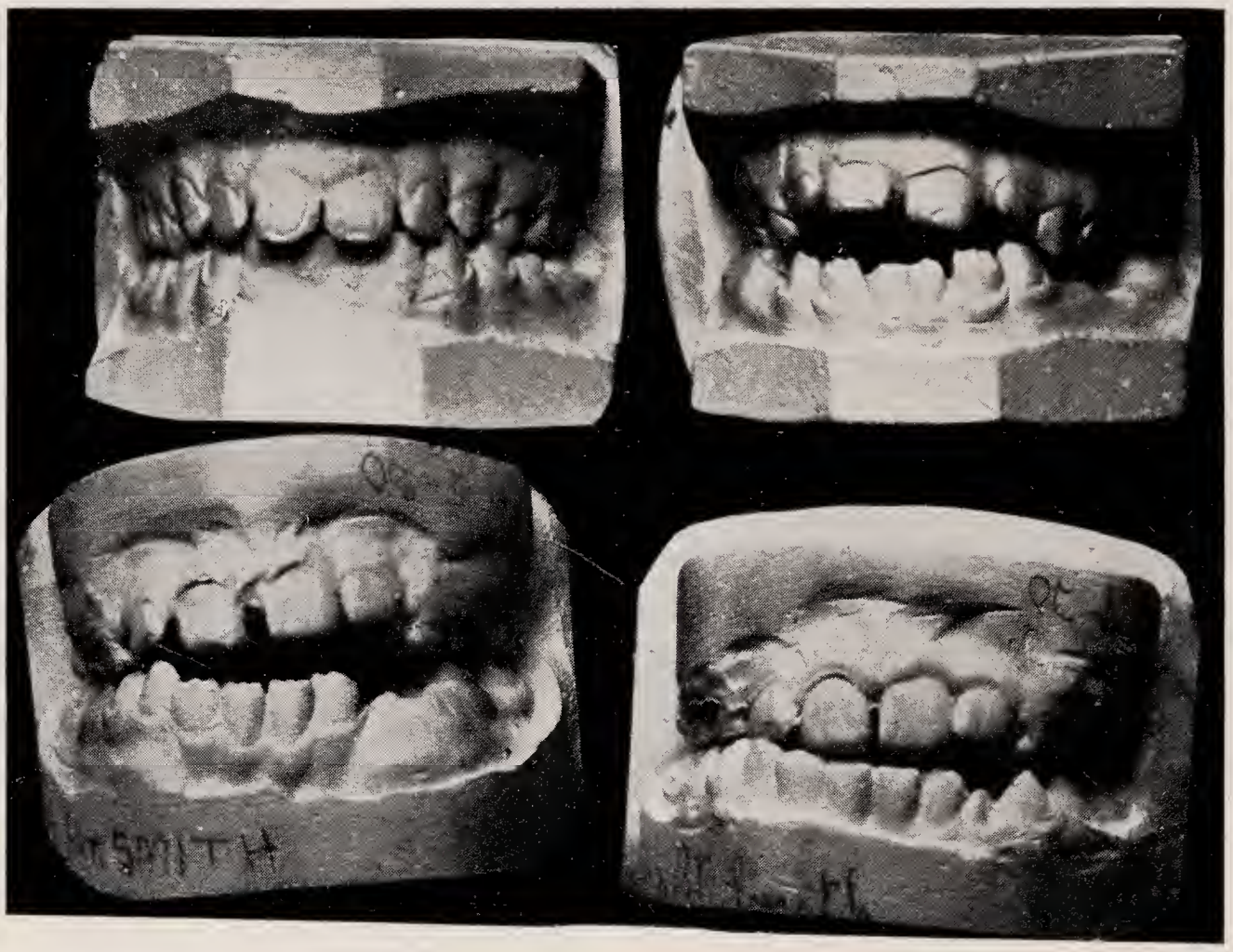
Treatment started July, 1926.



Unfortunately I kept the models sent with patient which are slightly broken, and did not take new ones. This case had only a very short time under intermaxillary traction. Ordinary simple vulcanite retainers with no action. Worn till September, 1930. No change in occlusion during 15 months.



Illustrating Mr. Cale Matthews' Communication.



Illustrating Mr. F. St. J. Steadman's Communication.

Mr. Cale Matthews, in reply to the President, said that in the post-normal cases the treatment was directed towards obtaining some function at the earliest possible moment. The cases of post-normal occlusion were aggravated unquestionably by lack of function. The first thing to be done was to endeavour to get function; this, together with any treatment which might be adopted in the shape of expansion, was a matter for individual liking in the choice of appliances. The first case he had shown, that of a small child of 8 years and 5 months, wore an expansion upper plate with a Badcock expansion screw, and that was altered as necessary, until it was possible to apply with it a combined plane. She wore for a short period intermaxillary traction. When the premolars were erupted, the appliances were put aside for a time and she was placed on exercises.

The second post-normal case, which he considered an extremely severe one, was treated very much in the same way, only the intermaxillary traction was more or less casual owing to school accidents with the appliance; it was not consistently worn on account of breakages during more than twelve months out of the four years in which treatment was undertaken.

The ultimate maintenance of the teeth was by fixed molar attachments with lingual and labial arches—plain wire arches—and exercises. In both these cases the children were of good parents, who were extremely interested, and assisted in every possible way. Unless one had seen at close quarters—as he had had the pleasure of seeing it—the work that Dr. Rogers was doing, the enormous improvement in these post-normal cases as a result of exercises would be almost unbelievable. It was really uncanny. He himself had seen at least fifty of these cases—severe post-normal occlusions, with individual teeth misplaced, many of the patients never having worn an appliance of any sort—some had been entirely corrected with exercises. No one else appeared to get these results. There were plenty of men who were using exercises as auxiliary to the use of appliances, but many of Dr. Rogers's results were obtained on exercises alone.

The question of intermaxillary traction was a very important one, and here he desired to interpolate a remark on the case which the President himself had shown earlier in the evening. That case was just the reverse of the one he himself had shown. The excessive growth in the President's case was in the mandible, while in his own case the excessive growth was in the maxillæ. If this latter persisted one might get stagnation—a very much more stabilised condition of the abnormality. The President had not made it quite clear whether in his case he had located the second upper molars. (The President: Yes, I had done so.) The treatment of such a case was to get the individual teeth into position, and then to start out to get a correct relation of the mandible to the maxilla. The other way, that of endeavouring to establish the relation of the mandible to the maxilla, and of then placing the teeth into position, was not to be advised, because in that case no assistance was forthcoming from mastication. That was how he would start out to treat the President's case now. He would individually place the teeth, and then set out to get the correct relation.

CASES IN PRACTICE.*

By F. St. J. Steadman, L.D.S., M.R.C.S., L.R.C.P., D.P.H.

Case 1. Open Bite due to Thumb-sucking.

The patient, a girl aged 8½ years, had been brought to the speaker with an open bite due to a habit of sucking the left thumb. A plate was inserted to bring the left upper central and lateral incisors towards the mid-line, and it was pointed out to the child that she was doing very great harm to her mouth by thumb-sucking. After she had worn the plate for a month the incisors had been brought to the mid-line. Mr. Steadman had then wondered what further treatment would be necessary to enclose the open bite. The case had been allowed to take its course for about a month and had then been

* *Transactions* of the Society, December 1st, 1930.

found much improved; he had therefore decided to leave the open bite and see whether it would right itself. Mr. Steadman demonstrated by means of models taken four months later the improvement which had taken place, although the open bite had not been treated.

Case 2. Another Open Bite due to Thumb-sucking.

Mr. Steadman reported that on November 22nd he had seen a case at the Royal Dental Hospital which had been treated by his colleague, Mr. S. Riddett. The patient was a girl of 9 years of age who had an open bite due to thumb-sucking. No treatment had been given beyond inducing the patient to cease the habit. Models taken after admission showed that the open bite had completely closed.

Mr. Steadman remarked that he had not been aware that an open bite could be closed without treatment beyond interruption of the habit. Exhibiting the models by means of the epidiascope, he remarked that further treatment would be needed, as the lateral incisor was becoming locked and would have to be pushed out, together, probably, with the central incisor. Nevertheless, a remarkable amount of improvement had taken place in four months as a result merely of impressing upon the patient and her mother the importance of ceasing the habit.

Case 3. Eruption of Incisor delayed by Supernumerary.

The patient, a girl aged 10 years, had been brought to the speaker with a missing central upper incisor. From the mother's point of view the history had been somewhat unfortunate. The dental surgeon had advised a radiograph about two or three years before; the radiologist had reported that the incisor was present, but had been doubtful whether a supernumerary was present or not. The family doctor had interfered and told the mother that nothing need be done, because the tooth would soon erupt of its own accord. Mr. Steadman had had a radiograph taken by Dr. S. Colyer, which had shown that the supernumerary tooth was present. This had been removed. Mr. Steadman had then tried to put a wire round the unerupted incisor, but had failed because the tooth was very high at the bottom of the sulcus. He had closed the wound, and a few months later the lateral incisor had been just visible in the sulcus on the left side. Mr. Steadman asked whether members thought that the tooth would now erupt of its own accord—the child was now 10½ years old—or whether he should put on a ligature.

He demonstrated the models on the epidiascope. The supernumerary incisor was present and the end of the missing incisor could just be seen. Dr. Colyer had pointed out that the supernumerary was external to the unerupted tooth—a most important fact from the point of view of the operator.

Discussion.

The President expressed his thanks to Mr. Steadman. He inquired whether any special steps had been taken to prevent the thumb-sucking children from continuing the habit. He said that he had sometimes found the prevention of thumb-sucking very difficult. There were many mechanical preventatives but most of them, in his experience, seemed to be ineffective. He asked whether the vicious habit had been arrested simply by moral suasion. He understood that

in the first case the appliance had only been used to move the left incisors towards the mid-line, and not to bring them down ; and that in the second case no appliances had been used at all. Commenting on the third case, the President recalled that a year ago he had shown a very similar case. Treatment had been exactly the same as Mr. Steadman's, except that he had not had the opportunity of enlarging the space for the central incisor owing to the presence of the supernumerary, which had been extracted. The lateral incisor had to be extracted to allow the central to erupt into position. The patient, a boy, was now 17 and showed no space whatever between the canine and the now erupted central incisor. The President suggested that a wise course in Mr. Steadman's case would be to enlarge the present space to allow the central incisor room to erupt.

Mr. H. G. Watkin said that he had had an exactly similar case in a child aged 11, who had shown no signs of possessing central incisors. An X-ray photograph had shown a supernumerary in position. He had removed the supernumerary, and had found by measurement that there was not quite sufficient space for a permanent central incisor to erupt. He had therefore widened the space and inserted two pinch bands with a bar across to maintain the space. In six months the tooth had come down perfectly. It had been as high as the tooth in Mr. Steadman's case had been, as shown by the radiograph. In Mr. Steadman's first case, said Mr. Watkin, the lower incisors did not seem to be pushed back, as he himself generally found in a case of thumb-sucking. He inquired whether Mr. Steadman knew the exact position in which the thumb had been placed in the mouth. Mr. Steadman's case, he said, seemed to indicate rather more pronounced thumb-sucking. Generally, after the habit ceased, the lip continued the action, and some apparatus was therefore necessary. In the first case the upper incisors did not seem to have been pushed far forward or the lower incisors to be pushed far backward ; the case might rather be one of finger-sucking, which tended more than thumb-sucking to produce an open bite. A finger-sucking habit would be more likely to correct itself than a true thumb-sucking habit. One of the best preventatives of finger-sucking was a cage applied over the finger, consisting of two or three rings of wire, somewhat like a dog's muzzle. Children soon acquired tolerance to unpleasant tasting chemicals.

Mr. Carl Schelling asked by what method Mr. Steadman had extracted the extremely difficult tooth he described without damaging the neighbouring teeth.

Mr. R. Cutler asked whether there were any grounds for the belief that thumb-sucking could often be cured by the use of a simple plate, which probably would have some orthodontic function as well. The vulcanite of an upper plate which covered the palate prevented the child from obtaining satisfaction of sucking its thumb, which Freud had thought was sexual in nature.

Mr. A. T. Pitts said that in his experience the condition called open bite might also be, as Mr. Watkin had said, an antero-clination of the upper incisors and a retro-clination of the lower. This abnormality tended to cure itself. It was the commonest form of open bite, and any batch of children up to the ages of 5 or 7 would contain a considerable number of cases. It was nevertheless relatively uncommon in the permanent dentition. If the condition tended to persist, it would certainly be found in the permanent dentition. This fact raised the important question of the part played by thumb-sucking. In many cases it did not play any part at all. He had seen a beautiful case of this at hospital : a child had her thumb in her mouth and showed a typical open bite ; the mother had said that the child had only started the habit in the last fortnight when a molar tooth had started aching, and that she had noticed the open bite a long time before the commencement of the habit. Mr. Pitts asked whether the practitioner ought to embark on this drastic measure of checking the thumb-sucking. He feared lest the psychological disturbance might be considerable. Dr. Harry Campbell had once said that a baby was a sucking animal, and that when it was not sucking the nipple it sucked its thumb for something to do. If an attempt was made to check forcibly a habit of writing with the left hand, the result was likely to be a stammer. Any attempt to stop thumb-sucking at all violently might bring about considerable mental disturbance. It was a safety valve for the child. He himself would resent strongly having a cage or a cuff extending over the elbow ; they were neither necessary nor desirable.

Mr. Norman Gray added his appreciation of Mr. Steadman's communication.

He said that he had the impression that thumb-sucking was often followed by mouth-breathing; a fact which gave it greater importance. He had happened this year to be in Egypt and had there met an old dental friend, Dr. Campion, who had been in charge of a large hospital. Dr. Campion had shown him a whole series of children who, when they went to bed, were taught to put a strip of ordinary adhesive tape over their lips. In every case this measure prevented mouth-breathing and thumb-sucking. Mr. Gray had introduced this device to his own patients, all of whom he had found quite willing to wear it after a short time; it had quite eliminated the bad habits. Speaking of Mr. Steadman's third case, Mr. Gray remarked that it was a good plan to watch such a case carefully for a time to see what happened. If the tooth were not then erupting properly, an attempt should be made to place a band on it to pull it down. This was better than continuing to wait in uncertainty.

The PRESIDENT asked Mr. Gray to give an amplified description of the appliance.

Mr. GRAY said that it consisted of nothing more than a piece of the surgical strapping ordinarily used to hold bandages and dressings in place. It was half-inch adhesive tape sold on a roll; a strip about two inches long was cut off and one end placed on the upper lip and the other pulled down and attached to the lower lip. One lady had told him that when she and her child had been on the way home to Europe they had had no tape left but had had some stamp paper, which had served the purpose equally well, since the child had been accustomed to the device for a long time. In the morning the tape was simply detached by a sharp pull, and left no mark.

The PRESIDENT asked whether children did not tear off the strapping when they were tossing in their sleep.

Mr. GRAY said that they did not. He had gone round the ward and seen six or seven children, all in bed inside their mosquito nets with strapping on their lips. It was quite easily worn and quite comfortable.

Mr. F. BOCQUET BULL inquired whether the children were native or English.

Mr. GRAY answered that they were English or European.

Mrs. MICHAELIS-POSSENER reported that she had cured one somewhat stubborn child of thumb-sucking. He was a boy of 7 and had a correlated habit, which she believed was very common, of twisting a piece of silk between the fingers of the other hand. He had done this from babyhood, and had never been able to go to sleep without doing it. She had cured him by persuading his parents not to give him the silk any longer. When he could not have the silk to twist, he stopped sucking his thumb. She did not know whether that was coincidence or whether the method could be used more frequently. She had read in a paper by Dr. Rogers in the *Cosmos* that the writer had observed that the two habits went together; she therefore inferred that it was a fairly common occurrence.

Mr. G. NORTHCROFT said that many members might recollect that Mr. J. H. Badcock had drawn attention to the correlated habits of thumb-sucking and blanket-fumbling; other writers had followed him. For many years before the anti-mouth-breathing valve had been introduced, Mr. Badcock had used surgical strapping on his own mouth, but, being an adult, he had found the plaster extremely painful. It was apt to pull badly when removed; it was probable that babies had smoother skins than Mr. Badcock.

Mr. H. CHAPMAN, referring to Mr. Steadman's first case, stated that he had treated a boy of about $2\frac{1}{2}$ years who had had an open bite with thumb-sucking; the speaker had merely instructed him to stop the habit. Models had been sent to him a year later and occlusion had been quite normal. Speaking of the treatment of thumb-sucking by a plate, he recounted an interesting experience with a patient, a boy, whom he had imagined would be extremely difficult to cure. He had happened to put in a Badcock plate; he had said nothing about thumb-sucking, but it had ceased immediately. If he had told that boy to stop, probably nothing would have happened. He mentioned the split plate because Dr. Richardson of San Francisco had described it as a cure for thumb-sucking and said that she had never known it to fail. She preferred it to the one which covered the palate entirely, and seemed to think that the device played an important part. The *International Journal* had recently mentioned a small device made by Dr. Darby; it seemed merely to consist of a wide ring, but the speaker could not understand how it was attached or made. Wire cages were very effective and parents liked

them. Referring to Mr. Steadman's third case, the speaker said that he had treated a child of about 8 years who had a deciduous central incisor still in position. The radiograph had shown above it a supernumerary tooth, and above that again a permanent central incisor. The deciduous tooth and the supernumerary tooth were removed. Since the arch was too small, it was widened and a space made large enough for the tooth to erupt. Nothing else had been done except to maintain the space. After five years the tooth started to erupt, and was still erupting. The child was over 14. The case differed somewhat from Mr. Steadman's because the missing tooth was exactly over the other tooth, which was erupted and rotated. Mr. Steadman's did not seem to be rotated. Mr. Steadman's had seemed a difficult tooth to pull down ; it would be hard to attach a band, and the risk of injuring the tooth and breaking it if a post were put in was too great to allow of such a measure. It would also be difficult to put a ligature on it, as it was very high up.

Mr. STEADMAN, in reply to the President's question, answered that no steps had been taken other than giving a straight talk to the child and the mother. He suggested that Mr. Riddett might perhaps tell the meeting of the steps he had taken.

In reply to Mr. Watkin, he said that he had used the term " thumb-sucking " because the lower incisors had been pushed backwards ; in this case, however, the thumb had exerted an upward and backward pull on the incisors and had not touched the upper incisors at all. The models showed the direction of the pull. The thumb had not been allowed to rest on the incisors sufficiently to injure them.

In reply to Mr. Schelling, he said that he had removed the supernumerary by making a semi-circular flap over the sulcus, turning back a large area over the soft parts and cutting with a chisel into the space, then taking a small piece of alveolus out, with great care not to go nearer to the other tooth than he could help. After making the space through the alveolus wide enough to allow the passage of the supernumerary but no wider, he had been able to feel its enamel and had very gently prised it out.

He did not think he could follow Mr. Pitts. That speaker had said that one must permit thumb-sucking to occur, or at any rate be cautious about stopping it. If that were so, he could not imagine what other bad habits Mr. Pitts would allow to continue for fear of upsetting the child's physiological (? *sic*) balance too abruptly. Surely the earlier they were checked the better ? He had been most interested by Mr. Gray's account of his device, and would certainly try it.

Mr. Chapman and Mr. Watkin had interested him very much by quoting similar cases. Their contributions showed the enormous value of these meetings. The President, he said, had remarked on the smallness of the space, which was not quite enough to allow the tooth to enter. Mr. Steadman said he was now widening the space, but had been afraid to do so at first because he had not been sure whether the tooth would come down or not. After hearing the other cases that had been mentioned that evening, he had learned that this tooth was very likely to erupt and that he could therefore proceed with much more assurance to make a space for it. He thanked all the other members who had spoken of their cases.

THE TEMPORO-MANDIBULAR JOINT.*

By S. WILSON CHARLES, L.D.S.

THIS joint differs from other joints in that under normal conditions there is no pressure exerted on the joint surfaces or articular cartilage during use.

When teeth are lost considerable bony changes may take place, changes may take place in the auditory apparatus, but the interarticular cartilage appears to be very resistant and would appear to thicken rather than be destroyed by pressure.

* Given at a Demonstration Meeting of the Society, May 5th, 1930.

The chief interest of the orthodontist is, however, in the growth of the joint and whether this growth can be influenced or not. Observation appears to show that owing to the peculiar type of growth which takes places during development, any external influence to be of any effect must be applied at the earliest possible age.

THE NORTHCROFT PLASTER PLANE.*

By George Northcroft, O.B.E., L.D.S.R.C.S.Eng.

The demonstrator regretted the apathy of the profession towards producing models, for orthodontic and other purposes, that were at all presentable or practical for permanent record, storage or illustration. The reproduction of models in some journals, compared to the meticulous accuracy and care displayed in similar work elsewhere, did not redound to the credit of the English profession.

Indeed, so small was the demand for what was really an extremely useful laboratory tool that Messrs. Ash, the original makers, had taken the outfit off the market and now only produced it to order. After an interval of twenty-five years an endeavour was being made to stimulate once more interest in this subject by the introduction of a stainless steel plane.

The whole outfit consists of a rustless plane and rustless steel blade of convenient size, a shooting board which enables surfaces to be planed at right angles to one another, a modified form of an engineer's scribing tool, and a tripod by means of which the base of models can be cut up parallel to the occlusal plane. To these have been added a small T-square and a fool-proof plane-blade sharpener. The underlying object is to obtain models uniform in appearance by a mechanical process adapted to the intelligence of a plaster boy.

The models having been cast in the usual way with stone teeth and plaster base, or compensated plaster or just ordinary dental plaster, the maxillary model is placed upside down on the rubber surfaces of the tripod so that the model rests on the first molars and cutting edges of the incisors (or the $\frac{e}{e}$ and $\frac{a}{a}$ in the deciduous dentition), the two together are now placed on a sheet of plate glass or similar flat surface, the point of the scriber is adjusted to the lowest portion of the base of the model, or in such a way that the depth of the "art" portion in the front of the model is one-third of the whole. A line is then scribed right round the whole uneven surface of the model, which defines the outline of a surface which must be produced by the plaster plane, which surface is now parallel to the occlusal plane. Placing the model on the shooting board on this surface, the back of the model is now "shot" off at right angles to this base and also at right angles to the median raphé. This can be tested by beginners with the little T-square. Next a point is drawn opposite the middle of the canines (deciduous or permanent) and to this point the sides are "shot" parallel to the cheek teeth, from these two points surfaces are "shot" to the frænum labii. The two back angles are now produced by adjusting the back of the model to the movable guide on the shooting board in two different

* Given at a Demonstration Meeting of the Society, May 5th, 1930.

positions for the right and left sides, thus "shooting" surfaces at an angle of 45 degrees to the back.

Having completed the maxillary model, it is placed in occlusion with the mandibular one, and placed on its base on the glass plate, and a line of the desired height is scribed round the lower model, and this will make the base of the mandibular model in its turn parallel to the occlusal plane. The model is cut up exactly as in the former case except that the front surface between the canines is cut on a curve and the base is cut out with a coarse cut ribbon hack-saw mounted in a fret-saw frame. The last step is a recent improvement by which the lingual surfaces are more adequately illuminated, permitting them to be easily photographed, and reminding the orthodontist of the necessity of studying the lingual as well as the buccal occlusion. The debris from the saw cut drops into a specially designed sliding bench apron, thereby keeping the laboratory floor and workman clean.

It is most important, if the surfaces are to be planes at true right angles to one another, that the cutting edge of the plane blade should always be at right angles to the sides, and for this purpose a clamp with a roller at the back was designed so that when sharpening the blade the edge should be kept square.

The whole process takes from fifteen to twenty minutes, whereas enthusiasts have been known to spend as a routine as much as one to two hours in producing adequate models by other methods.

Illustrations of the above can be seen in old catalogues which are beginning to be of almost historic value.

EARLY TREATMENT OF A CLASS II CASE.* AN EXPERIMENT IN THE USE OF SPRINGS ON REMOVABLE APPLIANCES.*

By G. H. Leatherman, L.D.S.

I am bringing forward the case of a little girl who came to me in 1926, when her mother made the remark that the child was going to grow up with the same type of jaws and the same shape of face as she herself had. I examined the child and took some advice from my partner about it as to whether any treatment ought to be done, because it was fairly obvious that the child had a very marked overbite. Her second temporary molars were in distal occlusion, and her chin was more or less under-developed. From 1926 until now she has been under treatment with a series of removable appliances, starting with expansion and going on to a bite plate, and now she is more or less a retention case. I have now got to the stage where I do not know whether to go on or leave the child in the condition to which I have got her teeth, and that is one of the reasons why I am bringing the case forward this evening.

From the models which I exhibit it will be fairly obvious that the lower incisors are biting almost on to the gum. I show the first appliance, which was used when the child was 3 years and 9 months old. I have a series of ten sets of models, bringing the case up to date, and I will run these through the lantern to show you the

* *Transactions* of the Society, May 5th, 1930.

appliances which were used at the various stages. There was no treatment done on the lower jaw; all the expansion was done on the upper jaw. What I am trying to illustrate is the amount of expansion we have got in the upper jaw in comparison with the earlier models, and how the lower jaw has followed out. The overbite is considerably lessened, although we have not yet properly corrected the distal occlusion. The patient is wearing now a plain vulcanite case with a buccal arch. In summary, I started the treatment with a small child aged 3 years and 9 months; she is now $7\frac{1}{2}$ years, and treatment has been carried out with a series of small plates in an attempt to expand her jaw and throw the lower jaw forward.

My next case is still in treatment, and I only bring it forward as an experiment in the use of springs on removable appliances. The two lateral incisors are standing in the arch, and the arch is very crowded. I show the type of appliance which is being used to correct that. It is a lower vulcanite plate, with an expansion screw in it, and you will see, resting on the top, some little lingual springs held in place with little locks. We have copied that from the idea of Oliver's fixed technique, and have been using it very successfully on this case. We have got the expansion, and the incisors have gone into place at a very reasonable rate, and without trouble to the patient at all. We are using the same thing now in the upper.

Discussion.

Mr. L. R. Marsh said that in regard to the last case, he was inclined to think the springs were unnecessary. The action of the tongue would usually avail to push forward the incisors. It occurred to him that, in regard to the first case, in comparing models taken at the age of 3 and at the age of 7 with a view to finding the amount of expansion, one might easily lose sight of the fact that there were four years of growth.

Mr. George Northcroft wished to point out one thing about the treatment of the first case. He understood that the last plate made had a labial wire going round the incisors, the case still being post-normal. In that event he thought the operator needed to take great care that the effect of the labial bar around the maxillary incisors did not prevent the mandible from coming forward.

The President asked whether Mr. Leatherman had paid any attention to the movement laterally of the deciduous canines in the first case, or whether they were simply moved with the general expansion of the maxillary teeth.

Mr. Leatherman, in reply, said with regard to the first speaker, who had considered that the little springs would be unnecessary because the natural expansion and growth would move the incisors into their place, that he could only repeat to him that he (Mr. Leatherman) was still more or less learning and experimenting with these things. Therefore he could not answer the question; he could only go on and see what happened with the case, which he hoped to bring to a satisfactory conclusion.

In reply to Mr. Northcroft's question, the position with regard to the child was that for about six months she had a plate without the labial wire, and her permanent incisors and laterals had a marked tendency to stand outwards. That was corrected by putting in a bite plate with almost a buccal arch, except that the arch was not joined in the middle. She had now her lower incisors as far up against the upper incisors as it was possible to get them, and his feeling in putting in an upper retention plate was to stop the incisors from tending to tip buccally again. This, again, was a question of waiting and seeing what was going to happen to the child. He had not particularly watched the lateral movement in expansion of the canines, but he was interested, and would like to know why the question was asked.

The President said that he had asked the question because he had found that generally deciduous upper canines seemed to hold the mandible back in post-

normal occlusion. In such cases he had made a point of paying special attention to the deciduous canines. He used additional pressure upon the deciduous canines when he wished the mandible to have freedom to move forward.

The PRESIDENT called upon the meeting to accord a hearty vote of thanks to those who had brought forward the Communications. He hoped that Mr. Leatherman's example would be followed by some of the other younger members.

The vote of thanks was accorded with acclamation, and the meeting then adjourned until November 3rd.

THE SKELETAL BAND.*

By LEONARD M. MARKHAM, M.B., B.S., L.D.S.

THE walls of the tooth-crown are made in the form of a double cone; an erect cone is formed by the lingual and labial-buccal walls; an inverted cone is the shape of the paired approximal surfaces.

A band gains stasis on the walls of a tooth-crown by compressing these two opposed cones simultaneously.

Compression of a single cone results in motion of the band which ceases only when compression ceases.

Compression of the double cone—the opposed cones—results in stasis so long as the compression remains.

A skeletal band is one so constructed that the force of compression in the band can act equally and simultaneously upon each opposed cone.

The skeletal band automatically takes up a position on the walls of a tooth-crown where the compressive force is acting equally in opposite directions—toward the neck and toward the occlusal surface.

Various models, diagrams, natural teeth and bands were shown to explain the action and construction of the skeletal band. Models showing treated cases were exhibited.

A patient was shown whose malocclusion had been corrected by removable apparatus acting upon the teeth by means of skeletal bands, complete and partial. Apparatus shown, then inserted and removed.

* Given at a Demonstration Meeting of the Society, May 5th, 1930.

AN ordinary meeting of the Society was held at 11, Chandos Street, Cavendish Square, W., on Monday, October 6th, 1930, with the President, Mr. H. E. MARSH, in the chair.

The minutes were read and signed as correct, and by a show of hands Mr. Cecil V. T. Colling-Baugh, 16, Lower Bridge Street, Canterbury, was unanimously elected a member of the Society.

OBITUARY.

The members all standing, the PRESIDENT referred to the great loss which the world of orthodontics had sustained since the last meeting of the Society, in the death of Dr. Angle. On that occasion he would content himself with a reference to the passing of this great figure, and at a future meeting he hoped to make more adequate reference.

In addition, the Society had sustained a loss in the death of one of its members, Mr. Hammell, and it was the wish of all present that the Hon. Secretary should communicate to the widow a vote of sincere condolence.

AN IMMOVABLE TOOTH.*

By Harold Chapman, L.D.S.

Female, age 13 yrs. 5 mths. (Figs. 6, 7 and 8).

Occlusion, etc.—Class I; abnormal medial movement of the left upper permanent molars. The left upper central and lateral incisors are almost edge to edge with the lower teeth; the upper right central has good overbite. X-rays show that the root of the left central has been almost entirely absorbed; the other upper incisors have roots normal in length.

History.—At age 11 the left central overlapped the right one; the former was pulled distally by rubber bands; to hasten treatment three bands were used simultaneously; the left central was almost extracted; it was pushed back and held in position; the probable duration of this period was about four weeks. At the age of 13 yrs. 5 mths. the left central seems to be getting shorter than the corresponding tooth on the right side. At age 12 yrs. 9 mths. the second left upper premolar was extracted.

Treatment.—The advice given was that the condition of the root of the left central was unfavourable to treatment with appliances, but the appearance would be improved if the right central were shortened by grinding.

Three and a half years later a friend of the writer reported that he had attempted to elongate the left central, but, instead of moving, it had moved every tooth in the head.

INJURY TO INCISORS.†

By Harold Chapman, L.D.S.

Male, age 11 yrs. 9 mths. (Figs. 9 and 10).

Occlusion.—Class II, Division 1. Unilateral on the right; normal on the left; the left upper permanent molar has moved medially to an abnormal extent; the overbite is excessive. General condition of the mouth is good.

History.—At age 8 yrs. 9 mths. the right upper central and lateral were knocked out in an accident; the central was replaced at once and remains as seen in Fig. 9. The left upper lateral responds normally to heat, cold and electricity; both centrals respond much more slowly to cold and electricity; no response to heat was obtained; the degree of response of the two teeth seemed to be similar; the X-rays (Fig. 10) show the left central root to be in better condition than that of the right central; no difference in the three incisors to palpation could be detected.

The lateral was also replaced after the accident; as it went black it was extracted.

The two first upper premolars were extracted at age 9 yrs. 9 mths., presumably with the object of facilitating orthodontic treatment. The right central is said to get loose when it is moved.

* *Transactions* of the Society, October 6th, 1930.

† id., ib.

The parents wish to know if orthodontic treatment is contra-indicated. The opinion of the writer is that orthodontic treatment would confer little benefit and should not be undertaken unless the parents realise that permanent retention may be required and that the treatment may cause the central incisors to be lost earlier than would otherwise be the case ; in any event artificial substitutes will probably be required in a few years.

Discussion.

(Mr. Chapman, owing to slight indisposition, was absent from the meeting, and his communications were read by Mr. Davie.)

Mr. A. T. Pitts said that the first of Mr. Chapman's communications raised some quite interesting questions, and suggested an investigation which might be worth carrying further. He had seen a good many children with infantilism, but had never been able to correlate any particular dental condition. There were various kinds of infantilism ; the two examples shown by Mr. Chapman were of dyspituitarism. He had seen some of these, and here again he could not recall any particular abnormalities in the dentition. Then there was renal infantilism, and in one case of this type he had seen a very marked retardation of the eruption of the teeth in a child of about eight or nine, though in other cases he had not been able to observe any particular correlation. One might sometimes see very profound conditions affecting the whole body, and yet the teeth and jaws might be absolutely unaffected. He recalled one child of 10, with the physical development of a child of 6—a wizened creature—although mentally extremely alert, she had suffered from cyclical vomiting for many years, yet here again the jaws were perfectly well-formed, and there was not a trace of caries in the mouth. It would be very interesting indeed to correlate on a larger scale some of these conditions.

Mr. H. C. Visick remarked that in the second of Mr. Chapman's cases, where there was apparently absorption of the root, it seemed almost an impossibility that a tooth with such a short root could resist movement with orthodontic appliances. If other photographs showed the root at right angles, that would explain it, otherwise it seemed inexplicable, especially as an attempt was made to pull it out of the socket. He had often noticed that the roots of teeth killed by a blow had slowly become absorbed away until they had just the appearance shown in the photograph. The tooth did not become septic, the pulp chamber seemed to be dried right up, and the tooth generally discoloured, and there was hardly any root. The X-ray photograph which had been shown that evening very much suggested to him a case of that sort.

Mr. Davie said that he could not reply to the discussion in Mr. Chapman's stead, but that Mr. Chapman doubtless would be pleased to do so when he received a note of what had been said.

INFANTILISM AND OCCLUSION.*

By Harold Chapman.

The dental condition, from the orthodontic point of view, of cases of infantilism has not been reported on, so far as the present writer is aware ; the opportunity is taken to present two cases.

Details of Case 1 (Figs. 1, 2 and 3). Male, age 24. Infantilism—type Lorain (pituitary tumour). Cheerful mentality. Occupation—clerk. Height 4 ft. $3\frac{1}{2}$ ins. Weight 4 st. 3 lbs. Calvarium large, out of proportion to rest of head. Dental arches very small ; teeth very crowded. At age of 18 four teeth were removed from the mandible and two from behind the upper centrals ; doubtless there have been other extractions not recorded ; several teeth are carious. Though the arches are small and in proportion to the rest of the face,

* *Transactions* of the Society.

the teeth are the size of those of an ordinary adult; the width of the upper central incisors is 8 mm.; the arch relationship is probably normal.

Details of Case 2 (Figs. 4 and 5). Male, age 15. Born 1910. Infantilism. Dr. Robert Hutchison says that he supposes that "some people would put the cause down to an anterior lobe pituitary defect." Height 4 ft. 2 ins. Weight 4 st. 2 lbs. (His brother, age 12, is slightly taller and heavier.) Occlusion normal; the upper central incisors are 7.75 mm. wide; teeth excellent, the only defects being a few small cavities; there is only one right lower premolar, and this is not perfectly formed, but the deciduous lower canine is in place on that side between the permanent lateral and canine; the latter occludes between the upper canine and first premolar; there is much calculus on the six lower front teeth. X-rays and photographs are not available.

This child was so tiny when born that he "could have been put into a quart pot." He thrived and got fat until he was 4 years of age; was breast fed for nine months. For a long time he ate very rapidly, in fact, bolted his food, but he is slower now. His father is certain he did not masticate his food till he was 13 years of age; he swallowed it rapidly in order to get out to play. He had a dummy from age 4 months to 10 months. At night he was not entirely a nose breather; tonsils and adenoids were removed at age 11. He had rickets very badly at 4 years of age; he ceased to grow at age 12. These details are of interest because they bring out the fact that this boy was subjected to a number of reputed causes of malocclusion, yet he has splendid arches and correct arch relationship.

There is no sign of puberty or thyroid insufficiency. He is intelligent. His physical development is perfect, but he is too small, except as regards the head and face, which are normal in size. His brother has no features out of the ordinary.

Considerable research work has been done to show that physical defects of parts of the body other than the head and face, are concomitant with maldevelopment of the masticating face and the occlusion. The first case shown may be cited as an example. The second case is an example of perfect development of the masticating face, including occlusion, but deficient development of the rest of the body. The writer is not aware that a case of imperfect development of the masticating face, accompanied by malocclusion, with perfect development of the rest of the body, has been reported, although there is probably not a practitioner here but could bring forward such a patient. In the light of what has been stated above, the following combinations of occlusion and body development seem to exist:—

Masticating Face and Occlusion.	Development of the rest of the body.
Normal.	Good. / Imperfect.
Abnormal.	Good. / Imperfect.

Discussion.

Mr. George Northcroft could not quite agree with the opinion of Mr. Chapman which had been quoted that the size of the mandible should not

Fig. I.

Photograph of the patient whose models are shown in Figs. 2 and 3. He is standing next to a man suffering from acromagaly, whose height is just under 5. ft. 6 in.

Illustrating Mr. Harold Chapman's Communication.

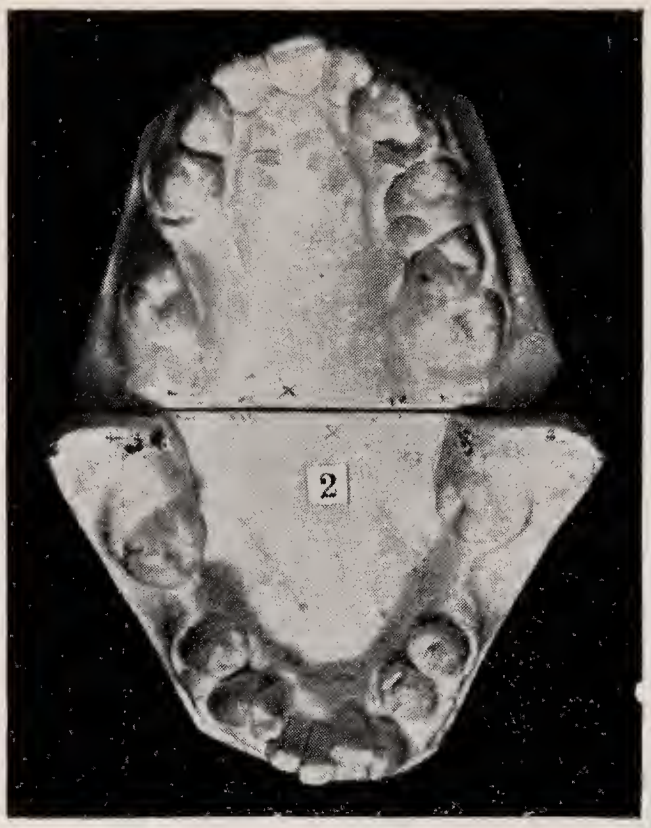


FIG. 2

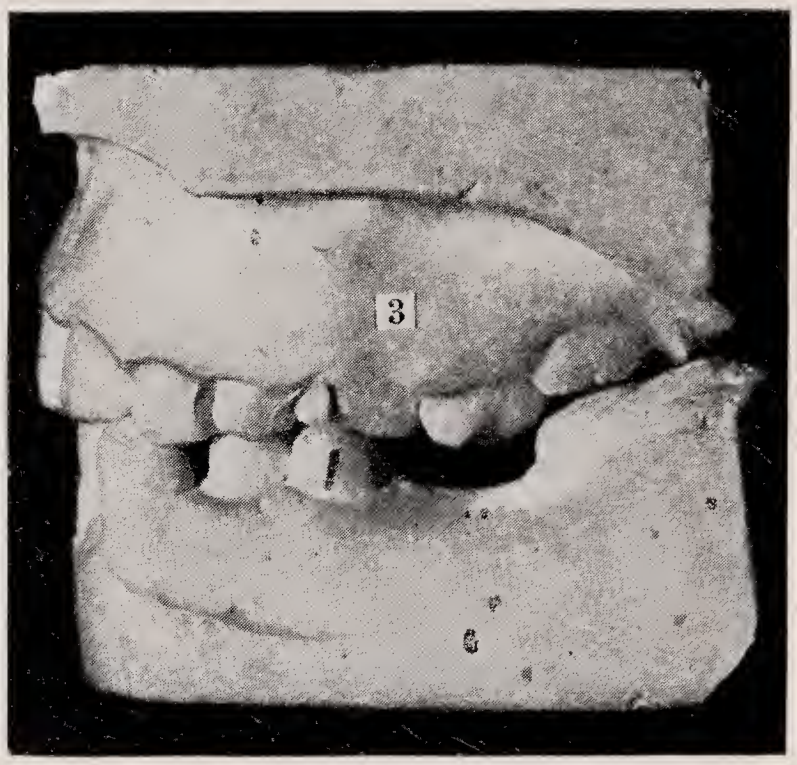


FIG. 3

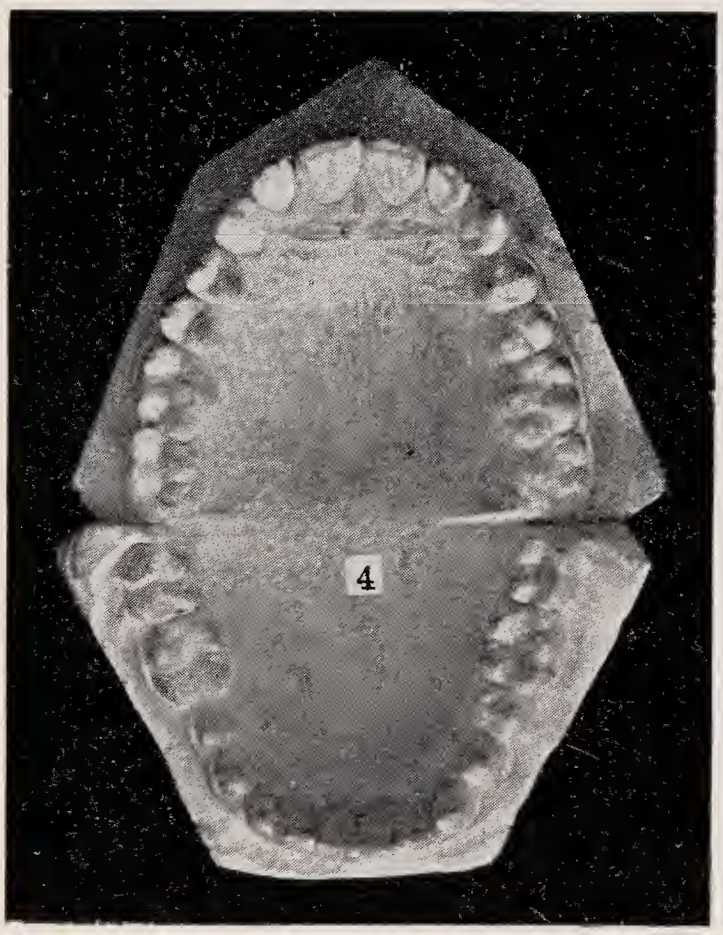


FIG. 4

Illustrating Mr. Harold Chapman's Communication.

Fig. 5.

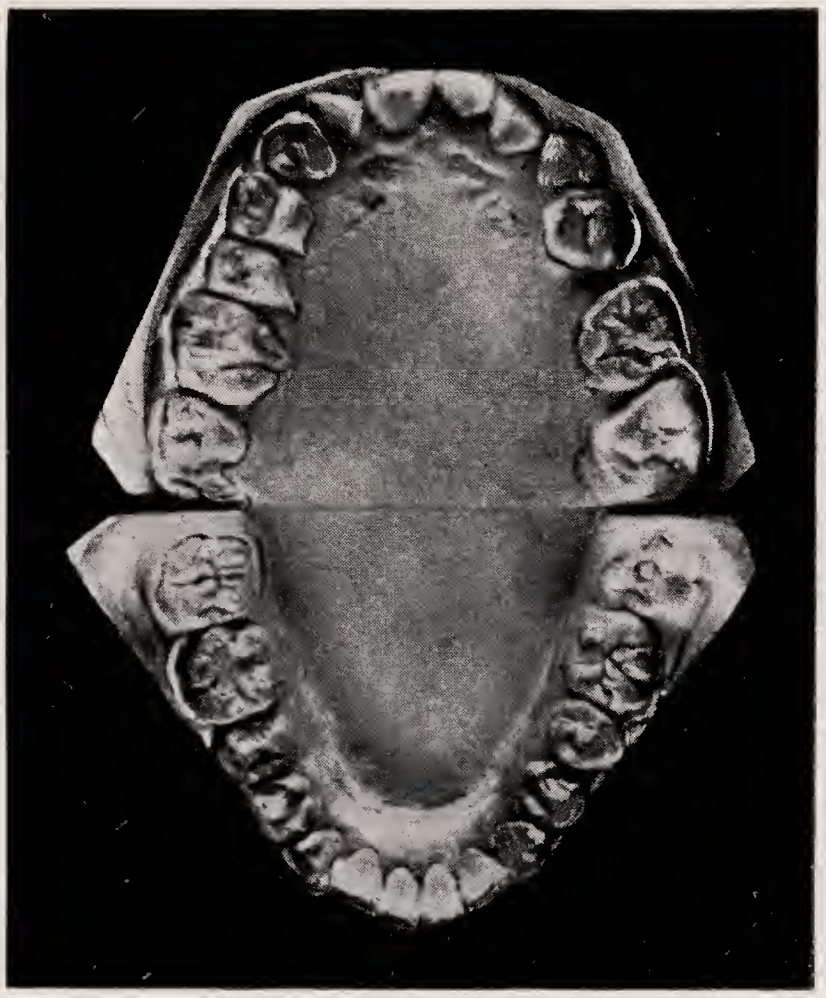
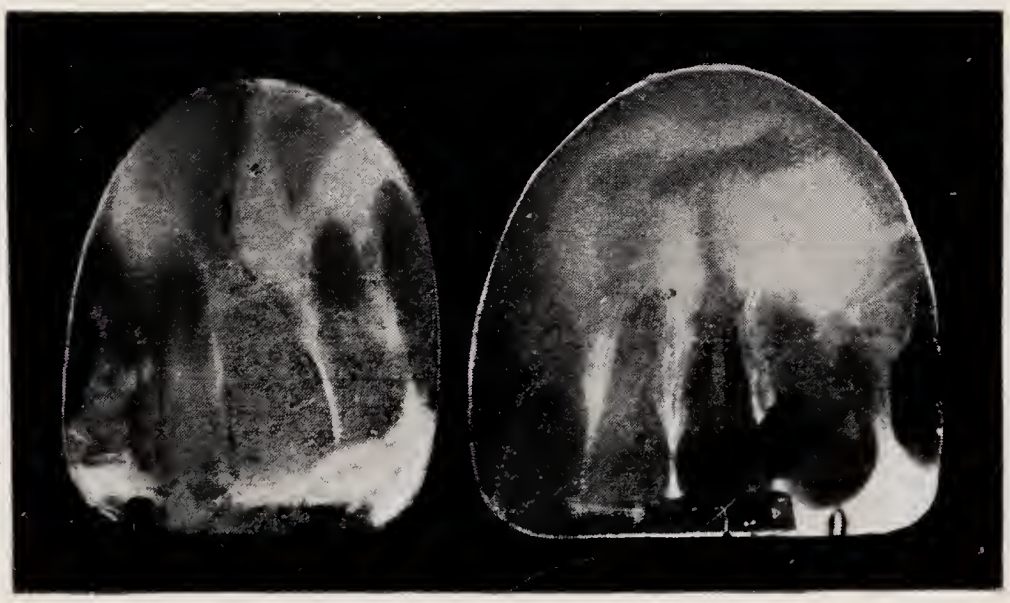


Fig. 6.

Fig. 7.



Illustrating Mr. Harold Chapman's Communication.

Fig. 8.

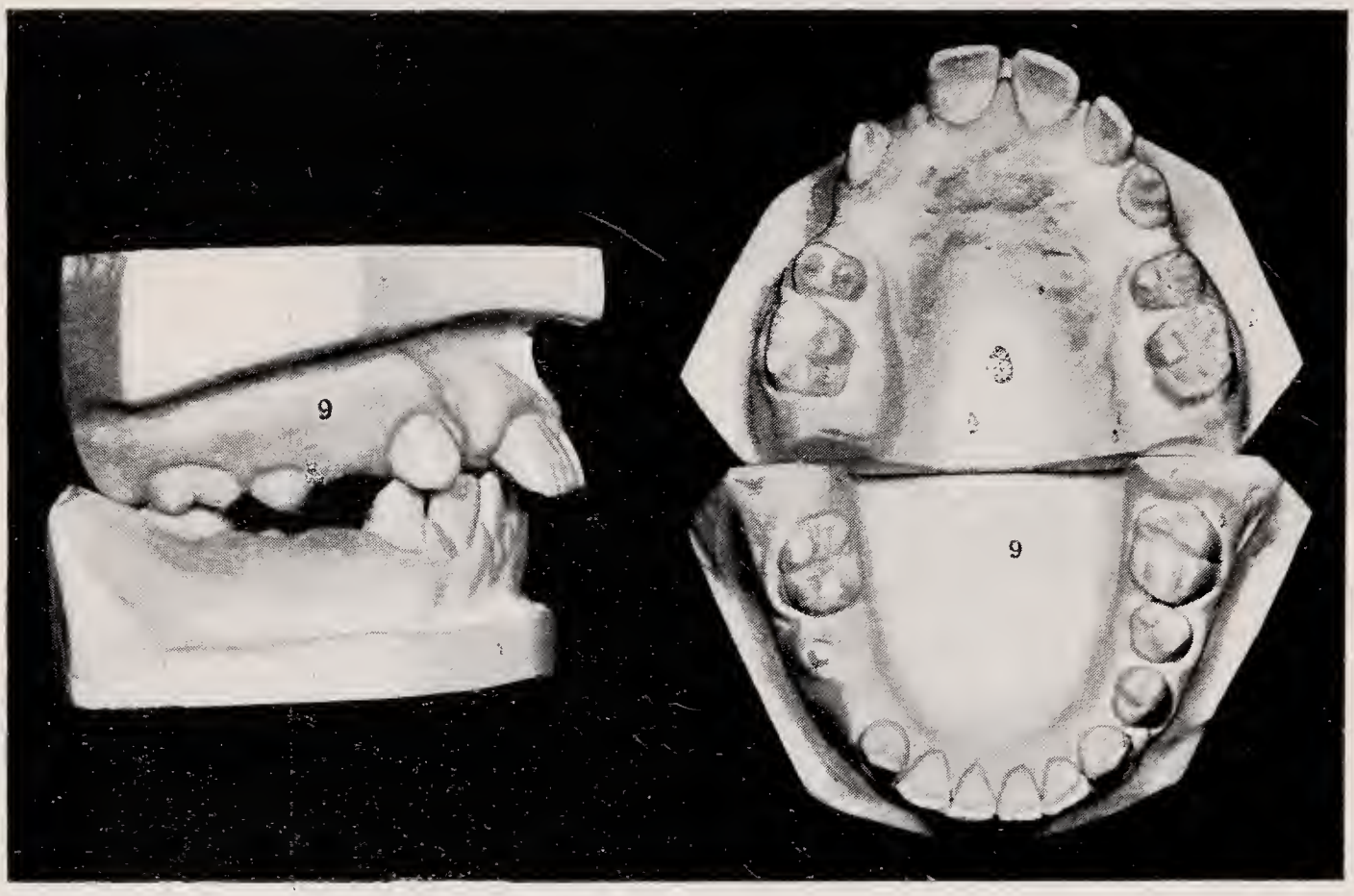


Fig. 9.

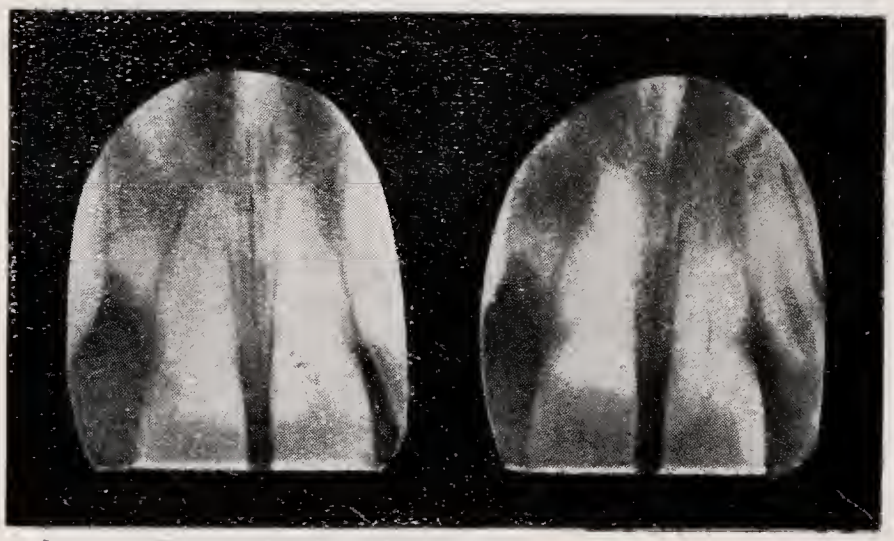
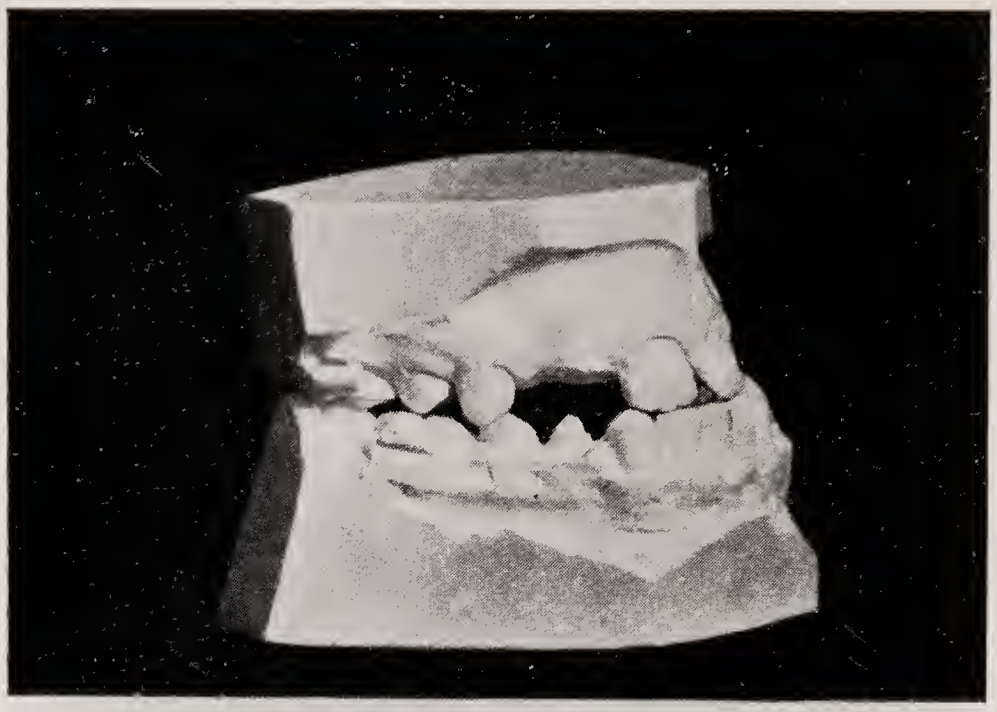


FIG. 10

Illustrating Mr. Harold Chapman's Communication.



Illustrating Mr. H. E. Marsh's Communication.

be reduced. He supposed that the possibility of a condition such as acromegaly had been thought of, and, of course, if there were such a condition present no attempt at a reduction of the size of the mandible would do much good. At the same time, the upper jaw showed marked lack of development, and as one tooth was absent, it seemed rational to attempt to make the size of the mandible correspond with that of the maxilla by reducing the mandible as well by the loss of one tooth. It was astonishing how much the circumference of the arch was reduced when such a space was closed up, and the teeth once more brought into contact. Possibly such a step might not be considered advisable at the present stage of treatment, but had it been done two years ago, it seemed, in his opinion, it would have brought about a satisfactory result.

A CASE FROM PRACTICE.*

By H. E. Marsh, M.C., L.D.S.

I am going to show models of a case from practice which is, I think, of some interest. The photographs and casts are from a child aged 12½, and I bring the case to your notice because of the remarkable disparity between the development of the maxilla and of the mandible. You will observe that the upper right lateral incisor is missing, and the central incisors have moved over to the right side to some extent. The canine is unerupted, and the upper second molars at 12½ had not appeared. In the mandible, which had been subject to orthodontic treatment, I may say, the second molars were fully erupted when the child was 10 years of age.

I would ask you to pay attention to the amount of space which exists already between the premolars, and between the small lateral incisor and the canine, which is partially erupted, and, in fact, all round the maxilla, as compared with the quite close contact between all the teeth in the mandible. Apart from the right lateral incisor, there is not much disparity in the size of the teeth.

I show a radiogram of the left side of the maxilla, taken at the age of 10. It shows the permanent lateral incisor, the permanent canine, the deciduous canine, the permanent first premolar and the first deciduous molar. I show also the right side. I may say that when I first saw this case two years ago the permanent central incisors (the lower incisors) were definitely biting inside. This case has had intermaxillary traction with elastics. Two years ago the disparity between the size of the mandible and the size of the maxilla was not nearly so marked as it is at present. The chin has simply continued to grow. There appears to have been very little growth in the apical region in the maxilla, and very great growth in the mandible.

I had the benefit of a consultation with Mr. Harold Chapman about this case eighteen months ago. I rather wanted to remove the two lower first premolars, which he was very much against doing, and I now feel quite sure that he was right, because had that been done, and had I been able to move back the lower incisors and canines with a view to closing the space, the angle of inclination of the lower incisor teeth would have been moved back still further than it is at present, and would have further emphasised the size of the process of the chin.

Finally, I show you the models in articulation, and the small size of the lateral incisor is apparent. The appearance of the child,

* *Transactions* of the Society, October 6th, 1930.

instead of improving, so far as I can see, continues to grow rather worse. I should be very glad to hear the views of any who are inclined to comment on this case. It is a case which has caused me a good deal of anxiety, and I should be very happy to assist the little patient beneficially.

Discussion.

Miss Russell mentioned that she had an almost similar case. It was in a girl who was now 21 years of age. The jaw was practically the same as that shown by Mr. Marsh. She had lost two teeth from the upper jaw. The condition looked to her to be gradually getting worse.

Mr. H. C. Visick asked whether the President had considered the use of a cap with elastics to hold the chin back.

The President replied that he had considered it, but had not made use of it.

Mr. R. Lindsay wondered whether members recalled the fact that Mr. Wilson Charles advanced the theory that there was a certain amount of growth of an obvious character at the condyle which influenced that of the mandible. The speaker believed that at present there was a good deal of investigation on the Continent which seemed to suggest that there was something in the theory. Mr. Wilson Charles was rather scornfully treated by some anatomists when he advanced his suggestion, but these cases helped one to believe that it might be well founded. Curiously enough, one of the orthodontic cases which he had to leave when he gave up practice was just such a case as was now illustrated, and after having got the lower jaw to a fairly good condition, it was the misfortune of Mrs. Lindsay and himself to witness a gradual relapse and it seemed now that the line of treatment might be more advantageously pursued in the manner suggested in Mr. Visick's question. If one could press back the head of the condyle along the glenoid cavity, one might interrupt the forward tendency and obtain a permanent cure. If that were continued until the rapid rate of growth in the patient had ceased, a lasting improvement might be expected. He had been rather astonished to hear Mr. Northcroft's suggestion, that by the extraction of certain teeth one could have improved the condition of that mandible. The position of certain teeth would have been altered by such a procedure, but the prominence of the chin could not have been altered by any extraction, and that was the great deformity existing in these cases. One was tempted to consider that extraction in that case and in the analogous cases to which reference had been made would not have been a satisfactory procedure.

Mr. B. Eady said that in support of what Mr. Lindsay had just said he could quote himself as an apparent example of an actual cure. From the age of 4 until he was 16 he had an inferior protrusion.

Mr. A. T. Pitts said that the fact that the prominence of the chin appeared to be increasing suggested that there might be at work some stimulating element of growth in the mandible. It was possible that the development of the third molar might be stimulating a growth of the body of the lower jaw ; this, combined with rather poor occlusion, might be tending to bring the jaw forward. He agreed that if the premolars were taken out on each side the retroclination of the incisors might look very ugly and accentuate the prominence of the chin ; but from another point of view, to break the chain of the teeth in the lower jaw might be quite a reasonable thing to do. It might be worth while to take an X-ray picture in order to study the position of the third molar and to consider taking out the second molar. He himself believed that the action of the third molar was often a disturbing factor in some of these orthodontic cases.

Mrs. Lindsay referred to some experimental work being carried out by Dr. F. Schmidhuber in Germany on the temporo-mandibular joint. He found that the growth in length of the lower jaw took place largely from the condyle ; any stimulus to that joint caused a growth in length of the lower jaw. Intermaxillary traction—which she understood had been carried out in the President's case—acted upon the condyle and altered its shape and the shape of the angle, as well as stimulating growth in length. It struck her that perhaps the growth in this instance had been stimulated by such treatment, and no amount of extraction would alter that condition of affairs. In fact, she thought that if the premolars were extracted, while there would be no reduction in size,

there would be an angle caused by the incisors which would emphasise the forward protrusion of the chin.

Mr. W. A. BULLEID asked if there was anything peculiar about the tongue.

The PRESIDENT replied that the tongue was normal. He added that the child generally was quite bright. As for the hereditary factor, the mother was a quite average little woman, and the child, who was normal in size in every other way, probably inherited her chin from her father, who was a six-feet-four man, with an enormous chin. The features of the child other than the chin were inherited from the mother.

Mr. H. G. WATKIN said that about eight or nine years ago he had an almost similar case. This was in a child of about eleven. No teeth were missing. All the upper incisors were inside the lower incisors. By intermaxillary traction he was able to get the mouth very nearly normal. She had been a regular patient, therefore he had not lost sight of her, and now there was about one half-inch discrepancy between the upper and lower incisors. The jaw seemed to grow persistently, with nothing to check it, and in some of these cases the lower jaw grew apparently by virtue of some inherent power which could not be stayed. He thought the extraction of one of the incisors would have been a very good thing. There was a certain number of "bricks" in the top arch, but the number in the lower arch was larger by one. Ten bricks could not be fitted over nine ; if the numbers were made equal there would be more chance of a fit. He added that in his own case none of the premolars met at all.

The PRESIDENT (Mr. MARSH), expressed his gratitude to those who had discussed his case.

A meeting of the Society was held on Monday, November 3rd, at 8 p.m., at 11, Chandos Street, the President, Mr. H. E. MARSH, taking the chair.

The PRESIDENT announced that the Society welcomed as its guests that evening Dr. Matthew Young, Dr. Wilton Marion Krogman, Mr. Storey and others. He invited them to take part in the discussion.

The Honorary SECRETARY read the names of the following candidates for election: Eric W. Fish, M.D., Ch.B., L.D.S. (Victoria University of Manchester), Dartford Road, Sevenoaks, Kent; Victor W. H. Hillyard, L.D.S.R.C.S.I., 12, Rosslyn Hill, N.W.3; Thomas L. Winn, L.D.S.Eng., 114, Station Road, Chingford, E.4. They were elected members of the Society by a show of hands.

DR. EDWARD H. ANGLE.

The PRESIDENT then addressed the Society as follows :—

At our last meeting you stood in silence as a mark of respect to the memory of the late Dr. Edward H. Angle.

It is fitting that the British Society for the Study of Orthodontics should pay tribute to the work which he did in our branch of science, and which made his name so well known, not only in the United States of America, but indeed throughout such parts of the whole world as the science of orthodontics has spread.

It may be that the very foundation of our own Society, twenty-two years ago, arose from the interest aroused by his early work, characterised as it was by strong conviction and dogmatic statement such as to arouse in the minds of others the desire to examine his assertions and to test his appliances for themselves.

That he was indeed a pioneer is evidenced by the fact that he read his first paper on orthodontics as long ago as 1887, and that seven editions of his "Malocclusions of the Teeth" were published between that year and 1907.

His classification of malocclusions, containing three classes, has been taught in the schools of all countries, and we find it to-day a convenient vehicle for use in orthodontic conversation.

He was an idealist. The full complement of thirty-two teeth in normal occlusion was his goal, and with extraction as a permissible measure in treatment he would have nothing to do.

The appliances of his devising are well known to us all, and will remain a lasting monument to his inventive genius.

We of the British Society for the Study of Orthodontics, with kindred Societies all over the world, mark the passing of a great figure in orthodontic science.

ORTHODONTIC STANDARDS.*

By M. L. Tildesley,
Research Assistant in Charge of the Human Osteological Section, Roy. Coll. Surg. Eng. Museum.

One of the common unconscious activities of the human mind is the formation of standards. We receive impressions, we unconsciously group them, we unconsciously add up the frequencies with which different impressions are received, and, all things being equal, these frequencies tend to determine our standard of what is normal and right. And again, by a similar unconscious process, marked deviations from these standards may be recognised by us as abnormal and wrong. When, however, we endeavour to pass from recognition to definition, from unconscious and perhaps vague standards to the precise determination of standards on a basis of exact observation and sound logic, we are faced with a very difficult task. Orthodontists are familiar with the problem it offers, and are still grappling with it in their own subject. The contribution towards solving it which I shall attempt to make is borrowed from another branch of science.

We all recognise that the field of knowledge has become so vast to-day that the tilling of our own special sector is apt to demand all our energies and attention—we have little time for walking about and seeing what our neighbours are doing with theirs. And yet we also recognise that this diminution of neighbourly intercourse, while it saves our time, is sometimes apt to diminish our profits. We miss the practical tips we might have picked up. And so if a neighbour passing by stops now to talk about the kind of fertiliser that other cabbage-growers have tried and found useful, it will perhaps not be unwelcome. Not even if she should also take upon herself to point out a few unnoticed caterpillars that are preventing the proper growth of some of your own cabbage-plants.

Three Basic Considerations concerning Statistical Records.—Let me begin by propounding three fundamental considerations to which, I think, you will readily subscribe.

First, in orthodontics, as in other sciences, observations on individuals are only of value in so far as they tell us something about the group they represent. The statement that of twenty-six English schoolgirls of a given age, nine-tenths, say, had decayed first molars, would be absolutely uninteresting in itself. It would only become of scientific interest if it indicated that English schoolgirls as a whole tend greatly to have their first molars carious at that age. This principle is even true of anomalies. Why would the news of a human being with a tail a yard long at once provoke our scientific interest? Not because it tells us of him personally, but because we learn thereby that *mankind* is capable of producing a three-foot caudal appendage. It is always the truth about a whole group that the scientist needs, be that group broad, as "mankind," or narrow, as for example all toothless two-year-old blue-eyed orphans of Italian parentage.

The second fundamental consideration is this: Whatever the classification, the individuals that it includes will vary in every physical and mental character. The range of variation will in each case have limits, but will often overlap the corresponding range for other groups. Body-length alone would serve to discriminate between a tiger and a titmouse, but not necessarily between a Scot and a pygmy.

* *Transactions* of British Society for the Study of Orthodontics.

The third is, that we rarely have the opportunity of examining all the individuals that would come into our classification, and can only try to get at the truth about them from samples. No two random samples will give us exactly the same result, but the larger the sample the more likely it is to be closely typical of the whole group from which it is drawn. Now for most of the characteristics with which we have to deal, quite elementary statistical calculation will be able to show how closely the results obtained from our measured sample are likely to be the facts concerning the whole group. And unless we can know this, our work is wasted. In practice, the degree of probability is indicated in a simple way that non-statisticians can easily learn to interpret. Thus the average height of a sample series of twenty schoolgirls of a given race and age might be given in inches as "64±1." The ±1 would be the "probable error," and would tell us that with schoolgirls of this description it is *an even chance* whether a sample of twenty would give us the height of the whole group correct to within one inch, or whether the answer would be further out. Or it might be expressed "64, s.e. 1.5," in which case the value of the "standard error" (1.5) is given instead, and indicates that there are *about two chances in three* that 64″ is within 1.5″ of the correct answer. I repeat that facts about the actual sample have no importance of their own; only the facts about the whole group are important. Yet how many dental papers print tables and graphs showing percentages, and averages, and variabilities, of *samples*, with no indication whatever of what are likely to be the corresponding values for the *whole group* they represent.* This is worse than a waste of time and print; it is a prolific source of error, since it leads the uncritical reader (and writer!) to suppose that the values given may be accepted as true for the whole group, without further question.

But now, with these principles in mind, let us consider more nearly the question of orthodontic standards.

Theoretical Considerations as to Standards, and Practical Applications of same.—As we have already to our hand a careful and detailed exposition of the views of the well-known German orthodontist, Dr. Paul Simon, on this subject, let us start with these and see how far we can agree and what we may wish to add. They are set forth in his book, "Fundamental Principles of a Systematic Diagnosis of Dental Anomalies" (first published, in German, in 1922), together with its appendix, "On the Norm-Concept in Orthodontics," which accompanied the English translation, published in 1926.

I have read this book with much interest, and with great respect both for the thoroughness of his biometric technique, and for much cogent and careful reasoning. The controversy and criticism provoked by this book naturally sharpened my interest. Simon examined the various considerations that might claim to determine an orthodontic standard. He finally concluded that though æsthetic considerations had some importance, it was still more important that it should "permanently comply with anatomical and physiological requirements, otherwise orthodontic efforts would be discredited."†

* Of course, if they also give the individual values, or if they give other data from which the student himself can calculate the "probable error" of the result (for example, the mean, standard deviation and size of sample, where the distribution may be presumed Normal), then it cannot be said that they give "no indication whatever," and their data can be used. But only when these calculations have been made.

† p. 354 *loc. cit.*

In order to realise this aim he decided that the standard should be set by a group of individuals possessing a full complement of teeth that are "anatomically correct and healthy"—a group that incidentally would form a very small proportion of the population.

This group will, of course, show variation in every character except that for which it was selected. How, then, extract from these variable values, standards for the other characters? He recognises the fact that they will in all probability be distributed according to the Normal curve, and says: "It is clear that these fundamental data of a mathematically conceived regularity are of the greatest biological value in investigations of the apparently inextricable variability of the individual."* But in practice its value for him was largely lost through his inability to make use of its properties. Such a curve represents the group as a unit, and at the same time the ever-present variation in the individual values that compose it. He only knew how to sacrifice this property of variation and substitute for it a single value, that of the mean. If he had known how, he might have extracted from the data a more flexible standard and better suited to the varying proportions of the patients to be treated; a standard related to, but not limited to, the mean. It is easy to calculate the distance from the mean within which any given proportion of the population of a Normal curve will be found. The standard deviation, for example, marks the limits between which about two-thirds will lie, and you may, if you choose, take this two-thirds as your standard of "normality" and endeavour to bring more extreme deviations within these limits by orthodontic treatment. Or if you find it better to take a much more liberal estimate of what may be accepted as "normal" for any given character, and agree to regard as such nine-tenths of the whole group you are considering, then the standard deviation multiplied by about one and two-thirds (1.64 to be more exact) will give you the limit of their deviation from the mean value. This method of forming standards for practical application in diagnosis is one that the orthodontist would find useful, I believe. I would only remind him once more that they should be based upon data from samples that are reasonably likely to give him a close approximation to the facts about the whole group.

Let us now see whether Simon was aware of this necessity. I will quote what he says on p. 155: "One must seek persistently for persons with normal dentures and prepare the data very accurately. . . . The number of cases that one practitioner may chance to gather over a period of time is not sufficient for this purpose, hence national orthodontic societies should appoint permanent index commissions." Again, on p. 202: "To establish the position of the denture in the head cephalometrically, one must complete a considerable number of examinations of normal dentures with the aid of gnathostatic and photostatic investigation. The author regretfully admits that at completion of this book he did not possess a sufficient amount of material to permit him to draw certain general conclusions. All cases examined up to this time are in quite general agreement; hence one may hope that future disclosures will not alter the results thus far achieved in any appreciable manner, to say nothing of invalidating them. The over-much cherished *a priori* supposition regarding a remarkably constant regularity of relations, finds its *a posteriori* confirmation in all investigations thus far conducted."

His "overmuch cherished *a priori* supposition" is the so-called

* p. 357 *loc. cit.*

orbito-canine law which has aroused such a storm of criticism. Again, on p. 138, we have a statement concerning it: "The orbital line intersects the dental arches on the right and left sides, as well the upper as the lower, at very definite points. In a large number of cases presenting normal occlusion a very definite relation between the dental points of intersection and the orbital plane is disclosed. . . . If these observations show, for example, that in dentures of European races the average of orbital intersection lies in the summit of the canine-cusp and that the vertical canine axis lies in the orbital plane, then this information constitutes a law, and the deviating relations found in individual cases may be judged thereby." You will find here no dogmatic assertion that this 'law' does in fact exist for European races, the data being as yet inadequate. Still less does he maintain, as has been attributed to him, that in all normally-occluded dentures the orbital plane he defines will pass through the tip of the canine cusp. It is only that he thinks, from his observations up till then, that that is probably its average position in German normal dentures. He had observed variation, but as we already know, he was unable to deal with distributions except to represent them by their mean value. Nor did he suggest a fixed relationship that would apply for all races, as some have rashly assumed. He says (p.200): "We must recognise ethnographic divergence. . . . Dental normality of German individuals alone will be considered in this book."

I confess that in all this I find little to quarrel with. Simon recognised the necessity of adequate observations for obtaining his means. At least he did in theory! In practice I find to my astonishment that he was content to use standard horizontal, sagittal, and transverse curves that were averaged from only three and four individuals! And yet his previous references to "a very large number of cases presenting normal occlusion" suggests that he had more than four cases available from which he could have calculated his norms. Another surprising fact is that these standard curves, being the average for three (in one case four) individuals, each aged 15 years (see p. 146), should be used by him, in practice, as standards by which to estimate the normality of individuals ranging in age from 7 years to 27 (pp. 262 to 317). Yet even if the average orbito-canine relation held good for all ages, as his observations suggested might be the case, sagittal sections through the palate would surely show age changes! What is true of one age is not necessarily true of another; what holds for one sex does not necessarily hold for another; observations on one race cannot necessarily be applied to another—all these are cardinal principles in biometric work.

Let us turn again now to that vexed question of the orbito-canine plane. We have seen that Simon's conclusions as to its average position in the German face were only tentative, awaiting further confirmation. In the Appendix published to the 1926 English edition of his book, however, Simon was able to quote the result of researches by Herzog on this question of the mean position of the orbital plane on German individuals of mixed ages. I have not been able to find a copy of this paper in London, so must assume provisionally that the definitions and technique employed were exactly the same as Simon's, though of course one can never take these things for granted without verification.* Herzog had examined 100 children

* Since writing the above, I learn from a comment in the *Deutsche Monatsschrift für Zahnheilkunde,* December, 1930, p. 1541, that Herzog did *not* use Simon's gnathostat, but an apparatus called the Orbitalbrille (orbital spectacles). This makes it the more necessary to verify the assumption that the determinative points used by both workers were exactly the same, and the results of the two proceedings absolutely comparable.

ranging in age from 5 to 14 years, and 37 adults—making 137 individuals in all. In 47 per cent. of these cases the orbital plane passed through the summit of the canine cusp, and in a further 32.4 per cent. through some part of this tooth : only in 20.6 per cent. did it fail to touch this tooth. No probable errors of these percentages are given ; but the sample is of respectable size, and if the ages are well assorted, or if Simon should be right in supposing the relationship unaffected by age, the distribution in the sample would probably be much the same as that in the group it represents. Simon, finding in this an "*a posteriori* confirmation" of his "cherished *a priori* supposition," now states his belief with correspondingly greater assurance.

In making this survey we have been able to consider a number of points bearing upon the choice and use of standards. Incidentally, we have also been appraising certain aspects of Simon's work, and it would therefore be of interest to see what some others think of it. Milo Hellman gives us his views in a paper published in the *International Journal of Orthodontia* in February of this year (1930). He states (p. 152) that "no one with practical experience in anthropometric procedure shows any disposition to take Simon's conclusions seriously. Thus Connolly, Broadbent, Wolfson and Oppenheim, who have done extensive researches of a similar kind, not only fail to verify, but definitely refute the basis of Simon's conclusions."

As far as I have studied the work of these various writers, their criticisms are not directed against the general basic considerations discussed above, but are confined to two matters. One object of criticism is the belief Simon expressed concerning the position of the vertical transverse plane through the orbital point ; the other is the clinical treatment he recommended for certain cases. Clinical treatment is outside my province ; but it might be worth our while to spend a little time to-night in discussing some of the anthropometric evidence these writers assemble as to the position of the orbital plane. The question is one in which orthodontists have shown considerable interest, and the discussion may serve to illustrate certain principles which are important in anthropometry. It would take us too far afield to-night to study in detail the published papers of all those whose names Hellman quotes. We can, however, examine the results obtained by two of them, Broadbent and Wolfson, who test directly the position of the orbital plane in adult skulls. The others adopt indirect methods of investigating the truth of Simon's thesis and with their work I propose to deal in a separate paper.

The Position of Simon's Orbital Plane.—One of the cardinal principles of anthropometry, as taught by the biometric school in which I received my training, is that in publishing measurements one must also exactly define them ; the fellow-principle is, that before using for comparative purposes data published by others, one must always look up their own definitions of the measurements they record, to see whether the various records are in fact comparable. If definitions are vague or lacking, the figures must be used with great caution, or perhaps not be used at all. Racial anthropometry has frequently led in the past, and still too often leads, to conflicting or unsound conclusions through neglect of these elementary rules. Let orthodontists take warning, and avoid this pitfall in their own use of anthropometry ! But now to Simon's orbital plane : he for his part has carefully defined the plane and described the technique by which he establishes its position. It is for us to do our part by ascertaining as

exactly as possible, before we begin discussing it, what it is we are discussing.

Simon defines his orbital plane as at right angles to his horizontal and sagittal planes (previously defined by him), and passing through his two orbital points, or, if one lies further anterior than the other, then through the point where the line joining them passes through the sagittal plane. The orbital points are determined by palpation of the orbital margin and then marked on the skin. They are defined as follows (p. 90): "The gnathostatic orbital point lies on the (uniformly very thin, that is, not puffed) skin at the lower bony margin of the orbit and perpendicularly below the pupil, when the head is in proper balance and the eye fixed at a point straight ahead. Thus the gnathostatic, that is *cephalometric* point, is not identical with the *craniometric* orbital point: the latter lies at the lowest point of the orbital margin and consequently more to one side." His horizontal plane was determined, he says, by these two orbital points and the two tragia,* and in orientating the gnathostat to this plane he made his orbital pointers touch the skin thus marked. A vertical edge 1 cm. long descended from the tip of each pointer to prevent it from entering the orbit, and this vertical edge was pressed as hard against the face as was possible short of discomfort.

Let us now see exactly where the point of our pointer will be resting relative to that part of the bony margin of the orbit which was palpated to determine the orbital point marked on the skin. First we must notice that the margin of the orbit in this region does not project so far forward as the bone immediately below it. The vertical edge we have described will therefore be brought up against this more projecting surface of bone, and will cause the point of the orbital pointer to come to rest a little distance anterior to the orbital margin. Again, we have not only a covering of skin and fat over the orbital margin and the projecting surface below it, but we also have the thin *orbicularis oculi* muscle covering both. We have to estimate the thickness of this skin, fat and muscle when the living tissues are pressed against the bone by the vertical edge of the orbital pointer, or else are pressed down upon the orbital margin by the palpating finger of the operator. In preserved specimens the tissues are already hard and cannot give us a direct measurement. Sir Arthur Keith estimates, however, that the combined thickness would be about 2 to $2\frac{1}{2}$ millimetres. Let us choose the lower figure, and reckon that the vertical edge will be approximately 2 mm. anterior to the projecting bony ridge below the orbit, and that its point, when brought level with the orbital point defined by Simon, will be about 2 mm. higher than the bony margin itself. The horizontal plane having been defined by the pointers (right and left) and by the tragia, a plane vertical to it is drawn through the points of the orbital pointers (slightly adjusted in the case of asymmetry, as previously explained, but the slight asymmetries would probably cancel each other in a series, and we will in any case disregard them in our present calculations).

This, then, is Simon's orbital plane. He warns us that the orbital

* It is of course impossible to ensure that four points shall all lie in one plane; the maximum number one can use in defining a plane is three; and later on, in describing the orientation of the head for the photostat (p. 120), he uses only three, namely, the left tragion and both orbitalia. The fact of his using four with the gnathostat suggests that the tragia were not marked beforehand, and that he allowed himself some margin in determining exactly where his posterior pointers should rest.

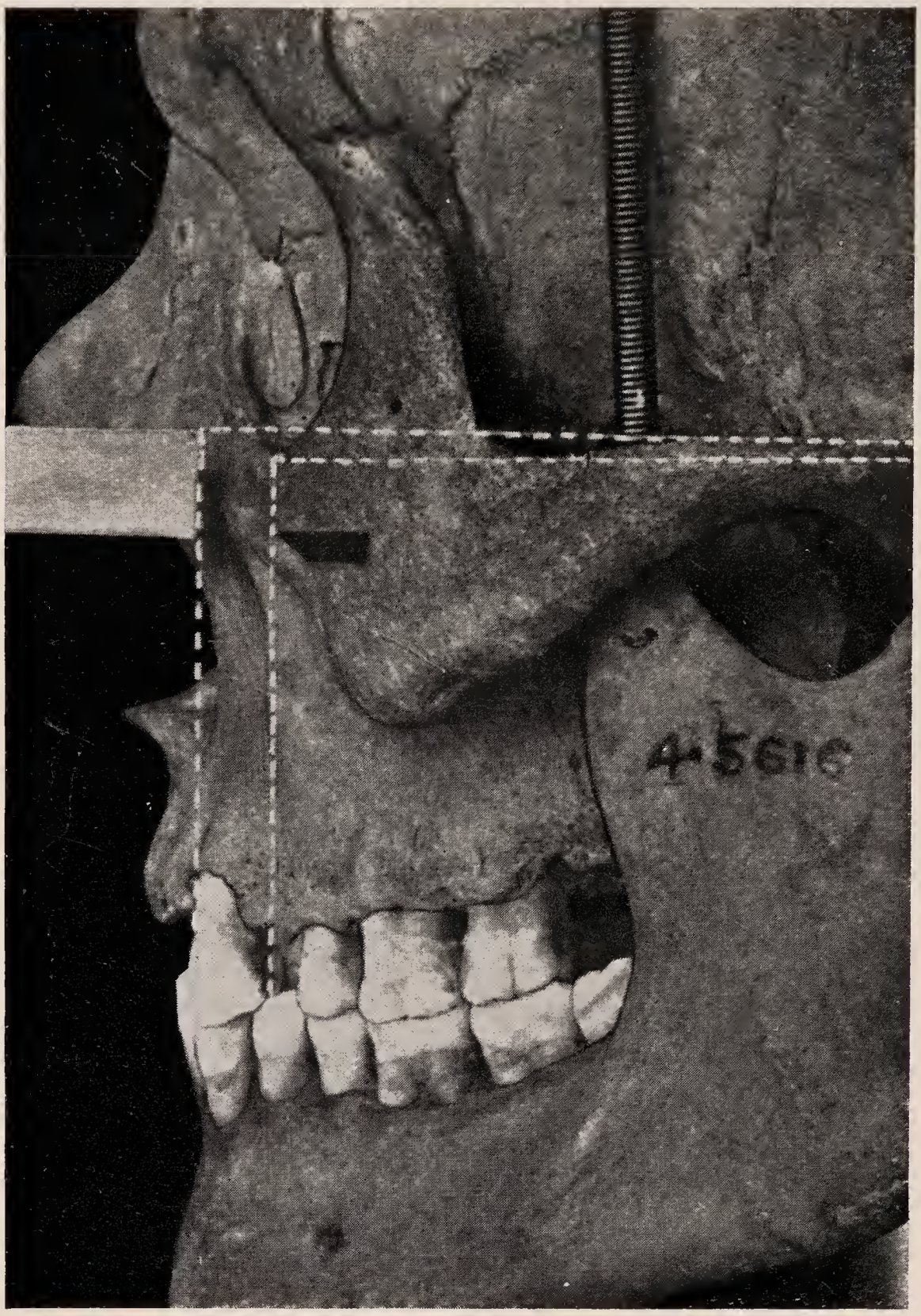


FIG. 1. To show relative positions of Simon's (above) and the Frankfort horizontal (below), and of their respective orbital verticals, on a sample skull ($\frac{1}{1}$).

Illustrating Miss M. L. Tildesley's Communication.

point used to determine both it and the horizontal plane is not the same as the orbital point used by craniometrists. It is important to examine the relation between them. The Frankfort horizontal of the craniometrist is determined by the two poria (whose level on the skull is stated by Rudolf Martin* to correspond as nearly as may be with the level of the tragia on the living head), and by the lowest point on the margin of the left orbit. As Simon has mentioned, this point lies "more to one side" than the *cephalometric* orbital point which he has used. Since the orbital margin as a whole itself slopes slightly backward from the position its inner portion occupies, the lowest point on its margin is not only lower than that selected by Simon but is also situated further back, as viewed in *norma lateralis*.

Assuming, therefore, that the tragion on the living and the porion on the skull supply us with approximately the same starting point for our cephalometric and craniometric horizontal planes, let us compare the direction taken by the two straight lines drawn thence on a left *norma lateralis* to the two different orbital points, and after that the direction of the lines drawn respectively vertical to them. As to the first two lines, that for the living head will reach further forward than the other, first by reason of the more anterior position of the part of the margin selected, secondly by the still more anterior position of the bone immediately below the margin, thirdly by the skin, fat and muscle, estimated at about 2 mm., which covers this bone. Even if the two lines lay in the same horizontal, a vertical from the cephalometric orbital point would pass through the upper denture at a point anterior to the corresponding vertical through the craniometric. But they are not on the same horizontal. The point of Simon's pointer is higher than the craniometric orbital point, first by the amount of rise of his part of the margin above its lowest point, secondly by about 2 mm. of skin and muscle which interpose between the margin and the finger pressed down upon it. This relative upward tilt of Simon's horizontal will necessarily throw his vertical slightly further forward and add a little more to the distance which divides its point of emergence on the dental border from that of the craniometric vertical.

The relative positions of these various points and lines as identified on a male British skull in the Royal College of Surgeons Museum is illustrated in Fig. 1. This skull has not been chosen as "typical": it has no more claim than has any other single specimen chosen at random to represent the group to which it belongs. It was the first skull I came to that fulfilled the conditions of being male, in good condition and with most of the teeth present on the left side. The tip of the wedge of black plaster seen on its malar bone rests on a point vertically below the craniometric orbital point, and was put there to make the exact position of this point clearer in the photograph.

Let us now turn to Simon's critics.

Broadbent.—We will take first Broadbent's refutation of Simon, published in the *Dental Cosmos* for 1927, Vol. LXIX, p. 799. He tested Simon's conclusions by measuring a series of seventy-five skulls of whites (presumably adult) of mixed nationality having "correct occlusion." He orientated the skulls to the craniometric Frankfort plane, and measured the distance between the tip of the canine cusp and the point at which the vertical plane through the craniometric orbital point cut the dental arch. He gives the means, variabilities and percentages for his seventy-five specimens, though without any

* *Lehrbuch der Anthropologie* 1928, II, p. 618.

accompanying indication of how likely they are to be the same as the corresponding values for the total "male white" population from which they are drawn. But even if they may be accepted as an exactly representative sample, and even if the mixed "male white" population of the United States were of the same race as the subjects measured by Simon and Herzog, there would be no cause for astonishment in the discovery that the average position of this point in Broadbent's series was 9 mm. behind the tip of the canine cusp: as we have seen, this vertical plane must always fall some distance behind Simon's.

It would, however, be unfair to put upon Broadbent the whole blame for failure to realise that the two planes were not the same: this must, in fact, be shared with Simon himself. The only account of the latter's methods which had come into Broadbent's hands at the time when he began his investigations, was a lecture delivered by Simon in America and published in the *International Journal of Orthodontia* in 1924. It was, of course, impossible for Simon, in one lecture, to go fully into all the points dealt with in his book, as he himself reminded his hearers. But it was unfortunate, as events showed, that there was in his lecture no word to suggest that his findings were limited to any particular racial group. It was more unfortunate that his account, on this occasion, of the horizontal plane to which the gnathostat was orientated, not only omitted to warn against confusion with the Frankfort horizontal used by craniometrists, but actually contained some misstatements. His account was as follows: "A gnathostat model is marked after three determined planes of the head or skull. The upper plane of the model is identical with the so-called 'Frankfort horizontal plane,' or, as it is more shortly called, the ear-eye plane. Imagine this plane to be a section made through four points of the head, viz. the two orbitalia or eye points, and the two tragia or ear points; the former are situated on the lower edge of the orbit just below the pupil, if the patient is looking straight ahead. The ear points are situated on the upper end of the tragus. This ear-eye plane is, therefore, of great importance, and has for the last forty years been of great significance also in anthropology, on account of its being the physiologic horizontal plane; that is to say, if somebody holds his head erect in equilibrium, that plane is absolutely horizontal" (p. 757, *loc. cit.*).

It may be mentioned in passing that the last statement, as it stands, is certainly incorrect, and falls into the same fallacy-breeding category as the "constant position of the first molars," or the "constant position of the orbital plane," or in fact any alleged constancy in inconstant humanity! The ear-eye plane was selected as determining the horizontal, because it was observed that it lay approximately horizontal in most individuals who were asked to stand upright and look at an object some distance away and at their own eye level. Its absolute horizontality is a "fiction" such as Simon himself discusses: it is necessary to select some plane that shall be treated "as if" it were constant, in order to have a plane of reference by which to measure the variability of other characters.

It was, however, the earlier part of the passage quoted which led to the misunderstanding between Simon and his American critics. His plane was *not* "identical with the so-called Frankfort horizontal plane," nor had it been used for the last forty years, whether on skull or on living head. Anthropometrists determine the Frankfort horizontal by reference to the *lowest* points of the orbits. In a later paper Dr. Simon

points out that " the ear-eye plane of the skull is a different plane from the ear-eye plane of the head*—and, we may add, especially if it is defined by the orbital points he selects instead of those in general use on the living—but anyone reading the statement that " a gnathostat model is marked after three determined planes of the head or skull " would have some excuse for supposing they were the same thing. There was, however, one signal set against this conclusion, full in the sight of all familiar with skull measurement : " the two orbitalia . . . are situated on the lower edge of the orbit *just below the pupil, if the patient is looking straight ahead.*" If this danger signal had been heeded, it would surely have led to further investigation of what Simon really meant, as he himself requested when the subsequent discussion showed that certain points in his lecture had been misunderstood. Apologising for his imperfectly spoken English, he said : " I am glad that it is not necessary for me to answer all the points that were touched in the discussion, because all opposite meanings which are possible in this subject have been already discussed in my book and in the other book which I will present to you. I hope that these two books will be translated into English during the next month, and I beg you all, as far as you are interested in this work, to read them, and, of course, to read them not only once but three times " (p. 784, *loc. cit.*). They appeared in English in 1926, the second as appendix to the first.

It remains to inquire whether the whites of mixed origin on which Broadbent worked would have been accepted by Simon as fit subjects for testing the " canine law " which he had tentatively propounded in 1922, but, as we have seen, subsequently enunciated with greater confidence. In his appendix " On the Norm-Concept in Orthodontics " in 1926, the only further data that he quotes in support of his conclusions are the figures obtained by Herzog, and both these and the four years' further experience which he himself had then had were presumably obtained in Germany. Our quotations have shown however that already in 1922 he contemplated the possibility of the canine-orbital relation constituting a " law " for " European races."† and as his American lecture was addressed to an audience that would obviously not be concerned with patients of German descent alone, we may infer that the omission to qualify his remarks in this sense was deliberate. He probably, therefore, did expect his " law " (which his lecture did *not* omit to explain as an average) to hold good for the mixed white population which was represented in Broadbent's material.

It would be interesting to know where Simon's vertical plane would have fallen on Broadbent's series ; and what is the order of relationship between the two planes. Evidence on this point is forthcoming as regards a series of British skulls, and I am greatly indebted to Dr. Wilton Marion Krogman, who has kindly permitted me to give here some results he has not yet published. In the absence of flesh it was, of course, impossible to get more than an approximation to the exact position of Simon's cephalometric orbital point and the tragion, in relation to the skull. A fixed allowance of exactly 2 mm. in two directions was made (as described above) for soft tissues covering the bone bordering the orbit, and the tragion was assumed to lie along the line joining porion to the orbital point thus determined, in *norma lateralis*.

* *Internat. Journ. Orth.* XIV (1928), p. 151.

† *Vide supra.* p. 59.

Of course, even if these estimates should give us absolutely correct the *mean* positions of the points in question, they will represent no constant values in the individual head. But, having no clue to the individual variations, the best one can do is to substitute the best available estimate of the mean value.

Dr. Krogman's measurements were taken on all those adult male British crania (89), of any period in the museum of the Royal College of Surgeons of England, which were sufficiently complete to orientate on the Reserve Craniostat, and had the upper left canine, premolars and first molar present at death, and at least the canine and second premolar still present in the museum specimen. Teeth being frequently missing in skulls that are recovered from graves, it was impossible to get a series of sufficient length without mixing the periods. The distribution of individual values for the character he measured was, however, found to give a good fit to the Normal curve. Comparative material in the shape of similar observations on racially more homogeneous series will show later how the variability of this mixed British series compares with others. The position of Simon's cephalometric point was determined in the manner described above; and on the left *norma lateralis* lines were drawn to the upper dental arch from this and the craniometric orbital point, at right angles respectively to the lines joining them to the porion (as in Fig. 1).

The tip of the canine cusp being worn away in many of these crania, Krogman took measurements to the posterior border of the canine instead.* The craniometric vertical was found to pass through the dental arch at a mean distance of 5.74±.24 mm. behind the canine and 10.00±.09 mm. behind the cephalometric vertical. The mean position of the latter, being just over 4 mm. in front of the posterior border of the canine as seen in *norma lateralis*, obviously falls very close to the tip of the canine cusp, in this adult British series of mixed periods. The fact that the mean position of the craniometric vertical in Broadbent's series of mixed-white adult skulls was 9 mm. behind the tip of the canine cusp, and in Krogman's 5.74 mm. plus the width of the canine, suggests (though it does not prove) that, in Broadbent's series also, the mean cephalometric vertical would probably cut the dental arch practically at the tip of the canine cusp.

Wolfson.—Let us now turn to Wolfson's contribution to the orbito-canine discussion. Whatever vertical relationships may prove to be common to all orthognathous races, it is obviously unlikely that racial prognathism would leave such relationships unaffected. It is, therefore, difficult to see exactly what contribution could be made to science by averaging the distance between the canine and any vertical plane whatever, on a mixed lot of human skulls belonging to races that are prognathous to any degree or to none, and are assorted in unknown proportions. This, however, constitutes two-thirds of the material on which Wolfson refuted Simon's conclusions, in a paper published in *Dental Cosmos* in 1927, p. 341. Twenty of his skulls were American Indian; the origin of the remainder is not specified, except that they were from the American Museum of Natural History, which doubtless collects skulls from all over the world. These forty might have been anything—and probably were! Wolfson orientated them on plasticine, so that the "sagittal plane" (not further defined)

* He measured the distance between the craniometric vertical through *orbitale*, and the vertical tangent to the posterior border of the canine.

was parallel to the table.* The uppermost porion and orbital point—which together gave him his Frankfort plane—may or may not have been vertically above their respective partners in this position; we incline, however, to the latter alternative. He projected these and other points upon the table, including "the highest point gingivally of the enamel crest" of the canine. He found that this point lay on an average 12 mm. behind the perpendicular drawn from the craniometric orbital point in his twenty American Indians and 11 mm. behind in his forty mixed. It is obvious that these findings neither refute nor confirm Simon's. Nor have they any value at all except in so far as Wolfson's technique can be accepted as giving exact and reliable figures for a small sample of American Indians of assorted sexes, and it is just on this point that we are beset by doubts.

Hellman.—We have seen that there was considerable excuse for Broadbent's and Wolfson's supposition that Simon's orbital point was the one used in craniometry. Hellman, however, when writing the article which appears in the February number of the *International Journal of Orthodontia* for 1930, had Simon's book in his hands and himself refers us to it. He also refers us to Connolly. Now Connolly had written a paper which appeared in 1927 both in the *American Journal of Phys. Anthrop.* and in the *International Journal of Orthodontia*, and he had made a second contribution to the latter in 1928. This was in reply to, and was published together with, Simon's criticism of the 1927 paper. Simon points out that Connolly has confused the cephalometric with the craniometric orbital point, and quotes from his book a warning against this mistake. Connolly replies that his interpretation was based, not on Simon's book, which he had not then seen, but on his American lecture. Anyhow, the point is cleared up in these two communications. It is, however, notoriously difficult to overtake an error when once it has been given a good start; and so we find Hellman, in 1930, still reporting observations on the position of the vertical plane through the craniometric orbital point, as refutation of Simon's thesis. He gives detailed results, obtained independently by a different technique, for thirty-four of the adult white skulls that Broadbent had already measured, and states (p. 154): "None of the skulls shows any relationship between *orbitale* and canine point. On the contrary, *orbitale* falls behind the canine in all instances and varies widely." Hellman, I understand, is now aware that he and Simon were referring to two different points. (This does not alter his view of Simon's conclusions, which he contests strongly on other grounds.) I take, however, this opportunity of clearing up the misunderstanding in so far as it still exists in the minds of any I am now addressing.

We are obliged to defer till another occasion an analysis of the other investigations contained in Hellman's paper, namely, those determining the position of the orbital plane on non-white adult material, those recording growth changes in its position, and those dealing with orbito-dental relations by other methods. And the question of the particular orthodontic standard proposed by Simon must now be temporarily abandoned for more general aspects of our subject.

Selection or non-selection of Material.—Orthodontists seem to be generally agreed that standards of "rightness" should be based upon

* The sagittal plane used by Broadbent would be at right angles to the auricular axis—the nearest thing that can be got on the craniostat to the line joining the two poria. Simon's sagittal plane was at right angles to his horizontal plane, already defined.

data obtained from series of individuals who themselves satisfy the observer as being "right." I have sometimes wondered, in reading through orthodontic literature, whether the criteria are always the same, whether the "normal occlusion" of some writers is the same as the "perfect occlusion" of others, the "anatomically correct and healthy," and so on. You may be in a better position than I to say whether the criteria applied by different workers vary, or not. In any case we may safely say that if it is important to select one's material according to certain orthodontic requirements, it is important also that the same criteria should be used by all orthodontists whose results are to be compared together; otherwise there is the same danger of confused argument, at cross-purposes, as we noted in the case of anthropometric measurements. But what I want to suggest to you now is a certain alternative to selection, or at any rate to such stringent selection as some orthodontists carry out. If jaws could be taken just as they come, except perhaps those that have had the course of nature modified by extraction, it certainly would be a great convenience to the research worker. Linder and Harth, for example, in a recent investigation, examined more than 2,500 persons in order to get 150 with "faultlessly articulating normal-bite."* I would like to invite your attention to two type-silhouettes of University College (London) undergraduates. These represent the average of fifty males and fifty females respectively, all of them English, but absolutely unselected as regards physical proportions—ugly and beautiful, slim and stumpy, all taken just as they came. And the results are two very attractive and handsome profiles, which no orthodontist would hesitate to acclaim as typical for his ideal occlusion.† If the average of an unselected series can give us such results as these, is it necessary to seek out at great labour individuals conforming to our own specification, in order to obtain our standards? Let us see if we can analyse what lies behind the fact that these silhouettes satisfy us æsthetically. We must put aside such considerations as the objective reality of beauty and our own recognition of it; not that it does not exist, but that this factor is not susceptible of scientific investigation. There is, however, another factor which can be analysed. In my opening remarks I referred to our unconscious formation of standards by the equally unconscious process of adding up our impressions. I was, of course, careful to say "all things being equal," because the influence of frequencies upon our unconsciously-formed standards, though usually strong, is not determinative. Thus in the realm of pictures or of house-furnishing, our tendency to accept standards accepted by the majority of our neighbours may be interfered with by our own superiority-complex, say, or by our uncommon sensitiveness to what is truly beautiful. The influence of some other personality at a receptive moment may for ever queer the answers to any unconscious addition sums, or at any rate our reaction to the results. These factors, however, are erratic in their action; the tendency which I have described is steady, and we see it reflected in the remarkably uniform tastes of the majority in any localised group. When we come to standards for judging good looks, erratic influences are likely to have less weight than in the other fields of appreciation that I have mentioned, and our standards will all the more rest upon a basis of summing up and averaging the

* Misch, *Die Fortschritte der Zahnheilkunde,* V, 821.

† These and a negro profile were thrown on the screen during the lecture. They are published in *Biometrika,* XXB (1928), opp. p. 400.

faces we see as we go about the world. When we see a person with a nose larger and heavier than the average, we decide it is too big and the person ugly; a mouth differing considerably from our average for mouths is too wide, too small, and so on. And if my analysis of a part of our mental processes is correct, it does much to explain why, when we are shown a concrete presentation of the average of our experience, we hail it as beautiful. Also, although I know of no objective reason why the type silhouette of the West African negro should be really less beautiful than the English silhouettes which it accompanies, my analysis would explain why we think it so. But we shall probably allow that this negro is good-looking as negroes go, if we have seen enough negroes to form unconsciously an average.

We may take it, then, that the average of an unselected series would satisfy æsthetic requirements in orthodontic practice.* As regards the weight that should be given to considerations of anatomical correctness (as apart from functional efficiency): supposing that the average denture in a given population did in fact depart so widely from "anatomical correctness" that it could not be accepted as a "correct" standard, would it not be an almost hopeless task for orthodontists to attempt to get so wayward a majority back to the standard that they in their wisdom had selected as anatomically correct? From a practical point of view, it does seem more hopeful to aim only at the less exacting standard that I suggested before, namely at the nearest point of that fence which encloses the middle nine-tenths of the population, say, and separates them from their more extreme brethren.

Correlation.—Up to this point we have only discussed the formation of standards for single characters considered without reference to others. Harmony and proportion are, however, the real aim of orthodontics, whether from the æsthetic, anatomical, functional or any other standpoint. I have dealt elsewhere with the considerable service that anthropometry and the science of statistics could render to the practising orthodontist from this point of view.† By working out correlation coefficients from adequate data, one could supply the orthodontist with charts which would tell him to what extent a given antero-posterior position of the upper incisors, say, was *unusual in combination with other characters*—with the antero-posterior positions of the nasion and sub-nasal point, for example (or any other points that might be preferred). Then, if by any chance a Class II case should turn up having a forward thrust of the upper incisors such as would not be found in one in a hundred faces with the given position for nasion and sub-nasal point, and at the same time a backward position of the lower incisors that would be reached in such a face more than one time in ten, it would obviously be the upper jaw that was contributing more to this disharmony. But of course I shall not be so rash as to assert, in default of evidence, that this particular combination does occur. Nor shall I expose my defenceless ignorance to the fury of any particular school of clinicians by suggesting that the upper jaw should be tampered with even then! I merely mention that it would be quite possible to prepare such charts for any given population as aids in accurate diagnosis.

* If the distribution should prove to be asymmetrical, one might adopt the "mode" instead of the mean.

† *Orthodontic Problems and their Solution.* Pub. by the Dental Board of U.K. as appendix to *The Ætiology of Irregularity and Malocclusion of the Teeth,* by Prof. J. C. Brash, 1930.

Conclusion.—If, in conclusion, I might be permitted a few positive recommendations, one would be that the word "constant" be permanently banished from the orthodontic vocabulary; also a long sentence upon the word "law"; and one of, let us say, five years upon "normal." At the end of that time "normal" might be returned to freedom, but only on the condition that it never again lent itself to imposture in connection with the "mean."

Finally, anthropometry and statistics are not orthodontia. But they constitute an avenue of orthodontic research; and unless the technique be sound, unless the data recorded be accurate, unless the interpretation of the data be soundly based, the avenue becomes a series of pitfalls, in and out of which the exploring orthodontist flounders forward, when he might be moving surely and steadily towards his goal.

Discussion.

The President then declared the meeting open for discussion. He asked Miss Tildesley whether in her opinion cephalometric measurements and classifications based on them could possibly be of any value at all as opposed to craniometric measurements. Measurements taken from points in soft tissues, and angles calculated from lines drawn between such points could not, he thought, possibly be of any value.

Miss Tildesley replied there was no doubt whatever that it was impossible to attain on soft tissue the same standard of accuracy as on bone. Nevertheless, orthodontists had to deal with living persons, and so, if they were going to use measurements at all in diagnosis, they must be measurements on the living. There was, however, a means of testing whether any soft-tissue measurements could be made sufficiently accurate to be useful: Two persons who were trained in the same technique measured the same series of persons independently, and repeated the same measurements after sufficient time had elapsed to enable them to forget the values they had recorded on the first occasion. The difference between the readings should be worked out as a standard deviation of error. Supposing that the difference between the mean values in different groups for any given character had been found to be 10 mm., and that the error of observation was likely to produce an inaccuracy to the extent of 2 mm. This difference of 2 mm. would not mask the real 10 mm. difference. If, however, the differences between the subjects were only of about the same order as the differences between the observations, measurement failed in its object. This constituted a perfectly objective test that could be applied to check cephalometric measurements; the pity was that people did not use it.

Dr. W. M. Krogman added a tribute of personal appreciation to the paper contributed by Miss Tildesley. He then spoke of the validity of the correlation between the measurements on the living body and those on the macerated skeleton. He had, he said, had the privilege of being associated with Dr. T. Wingate Todd, of Western Reserve University. There, in the Anatomical Laboratory, were housed some 1,800 skeletons, the exact age, sex, and stock of which were known. In handling this material as it went through the medical school it was first measured in accordance with standard anthropometric technique. After maceration all anatomical landmarks were translated if possible, into terms of the bony landmarks. By this means the nearest possible approximation was made—of course with an inherent recognised error—to the measurements on the living. The transition from the dead body to the bony skeleton was first ascertained, and then, by correction, the measurements on the living with reference to the bony framework were approached with a considerable degree of accuracy. As an illustration in point, Dr. Krogman called attention to the measurements made to determine the so-called cephalic index: relation of the length to the breadth of the skull, an index which is convenient for a rough classification of races. A great deal of such work had been carried out on both the living and the dead by independent investigators. The question immediately arose as to whether this data was comparable. Arising from this problem had come the research into the thickness of the cranial tissues, so that a given measurement on the living head might be stated in terms of measurement on the macerated skull. In other words, a correlation had been worked out between the measurements of the living and the skeletal populations, assuming that both were of the same race and

vicinity. Dr. Krogman then referred to another problem, which, although apparently irrelevant, certainly justified mention. This was the tendency of modern research, in any kind of scientific problem, to include the data of all related disciplines. Miss Tildesley had demonstrated that the study of orthodontics might well utilise the tool of statistics. Yet another tool might be useful in that study, viz., comparative anatomy. For the past years he had been working in the fields of comparative anatomy and comparative racial anatomy, i.e. physical anthropology, in association with Dr. W. K. Gregory, Dr. Milo Hellman, and Dr. T. Wingate Todd. These men have been working on the general assumption that man, taking his place in the animal kingdom, is subservient to the same growth rules that govern the entire kingdom. Therefore, if search be made for a fundamental mammalian pattern, man must necessarily be governed by that pattern. Similarly, specialising further, he must be governed by a primate pattern, and finally by what has come to be termed an anthropoid pattern. Thus it is customary, when dealing with the variations of human anatomy—and especially of human growth—to refer to the "anthropoid strain" which has lingered in the human body, and may be responsible for certain aberrancies in growth. To give one example: man possesses the same number of teeth as the anthropoid apes ; he has diminished the size of his jaw and also the size of the teeth. The interesting point is, however, that the decrease in the size of the teeth has apparently not kept pace with the decrease in the size of the jaw. Therefore, arising from this anthropoid heritage might come—he said "might" because they were not yet certain—the factors which predisposed to crowding in the dental arch. This research simply illustrates one general tendency of the interpretation of various phenomena of human growth, namely, that the human individual, as he grows, has not only a pattern unique to him as a human, but also a pattern which has been laid down far back in his phylogenetic history and which kept pace with the development of a generalised mammalian pattern, a more particular primate pattern, and, finally, an almost immediate anthropoid-ancestral pattern.

Mr. H. CHAPMAN remarked that the point in Miss Tildesley's paper which had particularly interested him had been her explanation of the differences between Simon and some of his critics which seemed to be the critics' difference between the craniometric orbital point and Simon's orbital point. She had shown most clearly how some very slight variation in the angle between the Frankfort plane and the orbital plane could disturb the diagnosis if the practitioner made any error in selecting the orbital point. He asked Miss Tildesley whether the two halves of the Frankfort plane were in the same plane or did they meet at an angle.

Miss TILDESLEY replied that the Frankfort plane did not possess two halves but was always a single horizontal plane. It was impossible to define one whole plane by more than three points, as there was no guarantee that a fourth point would lie in the plane. When the craniometrist used the Frankfort plane he used the two poria and the left orbital point. He could not say that he must have both orbital points. Simon had been very careful in his descriptions and definitions, but he had made the queer mistake—queer, because he had avoided this pitfall in other directions—of defining his Frankfort plane by both poria and both tragia. This could not be done. She had, however, never heard of anyone using different planes for the two halves of the head.

Mr. CHAPMAN said that he had used the term of two halves to clarify his meaning, but Miss Tildesley had fully answered his question ; he thought it likely that as the Frankfort plane did not pass through both orbital points the orbital plane would probably not pass through the canine at the same point on both sides.

Miss TILDESLEY said that asymmetry was the rule.

Mr. CHAPMAN then remarked that he was glad that Miss Tildesley had used the expression "Class I," for it made it easier for him to ask another question. Was the ear and the orbital point from which Simon made his diagnosis, free from those errors of growth which characterised the arches, maxillæ and other components in Class I cases, and could these points be used with satisfaction as fixed definite standards from which a vertical plane might be made ?

Miss TILDESLEY replied that there were no constants whatever in the skull. In the body, all was relativity. Supposing, however, that it were required to discuss the variability of some character, the investigator was compelled to consider some point as fixed and to work out the variability with regard to that point. Otherwise, he could work out nothing. Whatever point he

selected would be subject to its own variation. It was presumably desirable in orthodontic treatment to redress disharmony between the upper and lower jaws in such a way as to attain as much harmony as possible between the region of the jaws and the upper part of the face. If the position of any one point were to be selected as criterion of the degree of forward thrust of the upper face as a whole, she thought the choice of the orbital point was sound enough ; but it must not be presumed that the orbital point was infallible, nor that it maintained an invariable position in regard to the rest of the upper face. It might happen that the jaws were more in harmony with the rest of the face and the orbital point at fault. In practical work that reservation would have to be made. But the replacement of a rigid standard by a more flexible one of the kind described would lessen the difficulty. Also Simon said—and it was quite reasonable—that in his diagnoses he did not regard any of his various standards as ultimate or only standards ; he made a balance of different standards.

Mr. CHAPMAN confessed that he was not clear whether this orbital point was not as abnormal as the Class I cases themselves, or, to be more concrete, as the position of the canine in Class I. He asked whether one abnormality was not being used to diagnose another ?

Miss TILDESLEY asked whether Mr. Chapman meant that the two abnormalities usually came together.

Mr. CHAPMAN suggested that if the definition of Keith and Campion of the masticating face were accepted as applying to Class I cases, it was necessary to regard the two as abnormal.

Miss TILDESLEY said that Class I cases were usually regarded as due to local defects rather than to a more general disharmony, and in that case she presumed that this class of abnormality would not greatly tend to be associated with defects in the orbital region.

Mr. CHAPMAN said that he had been very interested by the profiles thrown on the screen ; he supposed that they would almost represent the profiles of normal occlusion from the orthodontist's point of view. It would be very extraordinary if Miss Tildesley, in her random selection, had been able to obtain so many practically-normals. He had with him, strangely enough, a note from Mr. Friel received that morning, which bore on this very point. Mr. Friel regretted that he would be unable to attend the meeting, but submitted a question: "whether it was possible to find a biometrical normal for occlusion." Later on in the note Mr. Friel said that there were far more post-normals than pre-normals, so that the average would be on the post-normal side. From the profiles that had been thrown on the screen, however, there did not seem to be any suggestion of a post-normal. Mr. Chapman thanked Miss Tildesley again for her paper.

Miss TILDESLEY, in reply, agreed that she had stated that most characters in the body had been found to follow what was called the Normal curve: a certain symmetrical curve which enabled the observer to make the predictions specified. There was, however, no reason for stating that all of the characters followed this curve until they were investigated. She had noticed in her reading that, from other people's observations, it appeared as if the distribution of the relative positions of the two first molars did not perhaps follow a Normal curve. If the curve was asymmetrical it would still be possible to deal with it statistically. It was, however, necessary first to determine from adequate data (i.e. on a few hundred individuals of the same race, sex, and age group) exactly what was the form of the distribution. It might be a uni-modal asymmetric curve with a longer tail on the side representing "post-normal" occlusions than on that representing "pre-normals." Or it might perhaps be a bi-modal curve reaching its highest point with "normally-occluded" individuals, but showing a second and lower mode representing "one-tooth post-normals," say: a form of curve which might be resolved statistically into two overlapping Normal curves. Either form of curve could be dealt with, but the form of treatment depended on the form of curve. So also did the interpretation to be put on the data, and the standards for practical application that could be evolved therefrom. If the clinician would supply accurate and ample data, the statistician would be able to contribute the method of dealing with them, and of using the results. But the data should be given in not less than ten or twelve categories, and the categories should be equal. Measurements in millimetres would satisfy these conditions. The width of the relevant teeth might, however, also be recorded and it would then be possible to classify also as quarter-tooth, half-tooth, etc., pre- or post-normal, as at present.

Annual General Meeting, 1930.

At the Annual Meeting held on December 1st, 1930, the President, Mr. H. E. Marsh, took the chair.

The Honorary Secretary, Mr. A. L. Packham, read the minutes of the last meeting. They were approved unanimously and signed by the President as correct.

The President announced the death of Mr. R. Lindsay. This announcement was received by the members standing.

The following candidate had been approved by the Council for election: Charles G. Searle, L.D.S.Eng., 1, Cantelupe Road, Bexhill, Sussex.

The President welcomed two visitors and invited them to take part in the discussion.

The Election of Officers and Councillors for 1931.

The President read the following nominations by the Council to the offices of the Society:—

President	Mr. A. T. Pitts.
Immediate Past President	Mr. H. E. Marsh.
Vice-Presidents	Mr. Bertram Samuel. Mr. H. G. Watkin. Mr. A. L. Packham.
Secretary	Mr. R. Cutler.
Treasurer	Mr. H. C. Visick.
Curator	Mr. L. F. Fouraker.
Librarian	Mr. H. R. Evans.
Editor	Mrs. R. Lindsay.
Councillors	Mr. Carl Schelling. Mr. F. St. J. Steadman. Miss K. C. Smyth.

No other names having been proposed, he declared these members to be duly elected.

Messrs. S. A. Riddett and R. E. Rix were elected Auditors.

Mr. A. T. Pitts proposed, and Mr. H. Chapman seconded the motion: "That the Society receive the Honorary Treasurer's report."

The Honorary Treasurer then read his report.

Hon. Treasurer's Report.

During the past year the Society's income has been £244 4*s*. 3*d*., which is about £11 in excess of that for the previous year. This sum is chiefly derived from members' subscriptions.

The expenditure has been £242 17*s*., of which £142 17*s*. represents the expenses of conducting meetings, and £100 has been added to the fund for the International Orthodontic Congress. This leaves a credit balance of £1 7*s*. 3*d*. on the year's working.

The Society's assets are: Prize Fund, 500 National Savings Certificates at a present value of £465; cash on deposit (I.O.C.), £200; cash at bank and in hand, £12 16*s*.; making a total of £677 6*s*., as against £550 18*s*. 9*d*. in the previous year.

Arising out of this, a member inquired whether the sum allotted to the International Congress was £300 or £200.

The Honorary Treasurer replied that it was £200.

Mr. F. St. J. Steadman proposed, and Mr. H. R. Evans seconded the motion: "That the Honorary Treasurer's report be adopted."

The motion was carried unanimously.

BRITISH SOCIETY FOR THE STUDY OF ORTHODONTICS.

INCOME AND EXPENDITURE ACCOUNT, December 1st to November 30th, 1930.

Income.

1928-1929. £ s. d.		1929-1930. £ s. d.
228 7 6	To Members' Subscriptions	239 8 0
1 17 10	,, Sale of Transactions	0 18 11
1 1 11	,, Deposit Interest	1 15 4
14 12 6	,, Donation	—
2 2 0	,, Sundry Credits	2 2 0
31 14 6	,, Dr. Balance	—
£279 16 3		£244 4 3

Expenditure.

£ s. d. 1928-1929.		£ s. d. 1929-1930.
25 0 0	By Rent	25 0 0
30 2 8	,, Printing	28 14 8
41 10 3	,, Printing Transactions	33 7 0
18 18 0	,, Reporting	18 18 0
1 1 0	,, Refunded Subscription	2 2 0
1 11 6	,, Library Account	—
—	,, Honoraria: Miss Smyth	7 0 0
—	G. E. C. Simpson, Esq.	3 3 0
—	E. Yarrow, Esq.	5 5 0
10 10 0	,, Refreshments	14 9 0
5 17 10	,, Petty Cash	4 10 0
0 5 0	,, Bank Debits	0 8 4
134 16 3		142 17 0
65 0 0	,, Transfer to Reserve Fund	100 0 0
80 0 0	,, Transfer to Prize Fund	—
—	,, Cr. Balance	1 7 3
£279 16 3		£244 4 3

BALANCE SHEET.

	Dr. £ s. d.		Cr. £ s. d.
Per 500 National Savings Certificates ...	440 0 0	...	465 0 0
,, Increment on ditto	25 0 0	...	—
,, Deposit Account	100 0 0	...	200 0 0
,, Income and Expenditure Account ...	100 0 0	...	—
,, Cash at Bank	6 0 7	...	8 17 10
,, Cash in Hand	4 18 2	...	3 8 2
,, Cr. Balance	1 7 3	...	—
	£677 6 0	...	£677 6 0

We have examined the Books and Vouchers and find the above Statement of Accounts to be correct.

November 30th, 1930.

A. GARROW,
M. PHILPOTS, } *Hon. Auditors.*

Hon. Secretary's Report, 1930.

Members will be pleased to know that the report for the year's working is (as in past years) a very satisfactory one. The Society continues to flourish. This is indicated by the enthusiasm with which the meetings are attended, and in the steady increase in its membership.

Seven meetings have been held on the usual dates. The President gave a most interesting and helpful address entitled "Orthodontics in General Practice." The distinguished visitor this year was Miss Tildesley of the Royal College of Surgeons, whose paper upon "Orthodontic Standards," viewed from the statistical outlook, was highly appreciated. Papers have been read by Miss Smyth and Mr. Wilson Charles.

The demonstration meeting was held in May and, as in former years, was very well attended.

An unusually large number of short communications have been presented this year. These are regarded as valuable contributions, and always enjoyed by the members. The papers and short communications have been discussed by twenty members and one visitor, out of a total membership of 230. The Council hopes that more members will in future give the Society the benefit of their observations upon the subject before them.

Turning to the membership of the Society, the report is as follows: During the year fourteen new ordinary members have been elected; three members have resigned, and the Society has suffered the loss of three members by death. The increase in actual numbers is therefore eight. The total membership on January 1st, 1931, will start at 236.

It will be interesting at this point to note how the membership has been steadily built up, say, since 1924. On January 1st, 1925, 170 (5 ladies); 1926, 194; 1927, 210; 1928, 218; 1929, 221; 1930, 228; 1931, 236. The present list is made up of three honorary members, three corresponding members and 230 ordinary members, eighteen of whom are ladies.

The Society received an invitation from the European Orthodontological Society to attend its meeting at Zurich in June. The President, Mr. H. E. Marsh, attended the meeting and acted as official delegate from the Society.

The Society received an invitation from the Governing Committee of the Second International Orthodontic Congress (which is to be held in London in July, 1931) to become a component society of it. This invitation was accepted with much pleasure.

The undermentioned gentlemen were nominated to represent the Society at the Congress as follows: as Hon. Presidents of the Congress, Dr. Sheldon Friel and Mr. A. T. Pitts; as Hon. Vice-President, Mr. Harold Chapman; as a representative upon the Governing Committee, Mr. George Campion.

The Council during the past year has given its most anxious consideration to the matter of the library and the museum cabinets, presented to the Society by Messrs. Lewin, Payne and Chapman, and very greatly regret to have to report that it is still impossible for them to be stored at the rooms of the Medical Society.

On July 15th this year the Society received notice from the Medical Society of London to terminate the tenancy of the meeting rooms at 11, Chandos Street. However, the communication from the Medical Society was not quite conclusive, and at the moment there is still some hope that it will not be necessary for the Society to change its accommodation. Negotiations to retain the Society's tenancy at 11, Chandos Street are in progress.

Mr. G. Northcroft remarked with regret that the present rooms contained no accommodation for the Society's museum or library; this militated considerably against its comfort. He said that he, for one, would not regret if it were found necessary that the Society should change its quarters, to occupy new quarters where the museum and library could be appropriately accommodated.

The Hon. Curator gave no report.

Hon. Librarian's Report.

There has been a slight increase in the number of books borrowed from the library during the current year, but even so the total number is surprisingly small.

It would therefore appear necessary to remind again members that the Society possesses a library.

No new volumes of importance have been received or purchased during the year.

Surplus copies of the *Transactions* have been presented to a few members in order that they might complete their sets.

Sets of surplus *Transactions* have also been completed, as far as possible, and presented to various institutions both at home and abroad.

Short Communications were then given by Mr. A. L. Packham and Mr. F. L. King.

CASE IN PRACTICE.

By A. L. Packham, L.D.S.

A CASE OF TWINS.

Mr. Packham introduced the case by reminding the meeting that twins might be uniovular or binovular. In uniovular twins the sex was nearly always the same, and the individuals were often very much alike both in their outward appearance and in their general characters, especially from the pathological point of view. Uniovular twins had only one placenta and one set of membranes; binovular twins had two placentæ and two sets of membranes and, although the two placentæ might be placed upon the uterine wall so closely together that they approximated, yet the circulations never anastomosed. Whereas, therefore, the circulation of binovular twins was completely separate, when twins were uniovular the blood from one individual passed to the other through the placental circulation.

Mr. Packham then exhibited a photograph of his twin patients. Their age was now, he said, about 13 and they were obviously good-looking. Their names were Joan and Jean—doubtless for the purpose of distinguishing them, though he could not do so in his own surgery. Jean had been born one hour after her sister. He had unfortunately not been able to trace the medical practitioner who had attended the mother at the confinement, and so he was unable to say whether there had been one placenta or two, or one or two sets of membranes. Nevertheless, he thought that these twins were most probably uniovular, because of their extraordinary similarity. Their eyes and their hair were of exactly the same colour; they had a marked affinity in their character and tastes and their minds worked upon the same plane. They were never apart for any length of time, and if they had been both in that room and one had left it, the other would have followed her in a very few minutes. If one made a remark while the other was out of the room, that other would in all probability make a remark to the same effect when she came in. When he had first seen them it had been quite impossible to tell them apart. About a year ago one of them had grown a mole upon her left cheek, and everyone concerned had been very pleased because they had thought the trouble was at an end. Five weeks had not elapsed, however, before the other twin had grown an exactly similar mole in an exactly similar place!

History.

They had both been breast-fed for one month only. He recalled the presidential address delivered by Mr. H. Chapman in 1925, which

had contained a wonderful set of histories of different families, by which he had demonstrated that breast-feeding did not seem to be a conclusive and definite factor in averting malocclusion of the jaws. From the first Joan, the elder, had thriven; Jean, born one hour later, had been sickly. They had continued in this way for two years until there had been a considerable difference between them. The younger, Jean, had then began to pick up and had ultimately outstripped her sister both in weight and in height. Joan, not to be outdone, had then raised herself to her sister's height, and at the present moment—aged 13—their heights and weights were exactly the same.

Their lives had been completely uneventful. They had been practically free from illness except for measles, which, of course, they had had together, two years before. They had no caries whatever in their mouths and had never had any, with the one exception of the left upper first molar; the caries had occurred in the same fissure—the posterior—in the same tooth of each child.

Mr. Packham then showed slides illustrating the twins, and models of their dentitions. The dentition in both was very nearly flush. The development of the premaxilla and of the front of the face generally was good and both sisters had a fair amount of space. Mr. Packham said that he had amused himself looking at the differences between the rugæ; they were much more marked in Jean than in her sister. Both twins showed a slight degree of imbrication of the right lateral incisor. Jean's early backwardness did not show itself at the age of 11, when the photograph was taken. Another picture, taken at the age of 13, showed the flush occlusion persisting in both sisters. A left side view showed that Joan was just about to erupt the second premolar. The front view showed further differences. Jean, the sister who had been sickly in babyhood, now showed definite signs of crowding and under-development of the front part of the maxilla, particularly on the left. The first upper premolar had cut outside the lower. The right side, however, showed practically correct eruption and was identical with that of Joan. The only defect was the persisting flush occlusion.

The palatal view at the age of 13 showed a degree of crowding which had not been apparent two years before; one enough to raise apprehension of unsightly appearance in the future. In both sisters the posterior fissure of the left upper first molar showed caries; the only difference being that in one sister it had progressed rather more and broken down the posterior wall. In the other, the enamel was very thin, but he had bolstered it up with cement.

Discussion.

Mr. Pitts said that he had encountered two interesting cases of identical twins. In one case the twins had both had fragilitas ossium; they had broken innumerable bones and both had the distinctive greyish, glassy appearance in the enamel, which was very thin and translucent, a common appearance in these cases. The other pair of identical twins showed the same slight but definite irregularity of the teeth.

Mr. Watkins suggested that the crowding in Jean's dentition was due to the retention of the second deciduous molar, which occupied more space than the second premolar. When that came out, the crowding in front would be relieved.

CASE IN PRACTICE.

By F. L. King, L.D.S.

This case had, the author said, caused him some thought both in its diagnosis and its treatment. This might have been due to his lack of orthodontic knowledge, in which case he hoped that members would be tolerant and lead him on the lines of thought which seemed to them to be appropriate. If, on the other hand, the case was actually an abnormal and unusual one, he hoped that it would prove interesting to them.

The patient was a male child, aged 4; the models showed that all the lower teeth were in buccal occlusion. The lower centrals were outside the uppers, and the molars were all buccal to normal. The lower teeth were very well placed and normal development was no doubt taking place.

He said that the question present in his mind was how to group this case; as a lack of development of the maxilla or as an overgrowth of the mandible. If it was the former, was it due to the teeth themselves being badly placed on a normal buccal base, or was the buccal base too small? In the latter case, presumably there was no hope of doing any further good to the case. On the other hand, if it was a case of abnormal growth of the lower jaw, was it possible to stop that growth in any way? Moreover, from the photograph it appeared that the patient had rather a protruding lower jaw, which the mother said was merely a habitual posture. Nevertheless, the speaker thought from the model that the boy could not help protruding the jaw.

The speaker exhibited on the screen the models made from the mother's mouth when she was 10 years of age by a member of the Society. He had the models placed in occlusion.

Discussion.

The President complimented Mr. King on bringing the case forward, for he had not been for long a member of the Society, and it was a good thing that younger members should make communications. The President hoped that he would continue to bring forward cases from time to time and that he would illustrate them by lantern slides rather than by models projected by the epidiascope. The age of the patient made the case interesting, because it was likely that it would become a regular Class 3 prenormal occlusion of the mandible. At present, however, it presented what might be called an edge-to-edge condition; the teeth in the mandible were well spaced, whereas those in the maxilla were slightly imbricated. The photograph showed that there was considerable disparity between the size of the chin and the inferior maxillary bone and the size of the superior maxilla. The President imagined the case to be one of hereditary retrogression; it would be interesting if Mr. King could tell them whether there was an ancestor who had had over-development of the chin.

Mr. King said that he had no history of such an ancestry.

Mr. H. C. Visick asked whether the upper and lower incisors showed any sign of attrition.

Mr. King replied that they did not.

Mr. L. Levien thought that it was impossible to answer Mr. King's question of whether the lower jaw was too large or the upper one too small. The answer might be that both were so to a slight extent. The lower jaw might have begun to grow a little wider than it should; the inclined planes would then have begun to work and the upper dentition would naturally have been narrowed. In any case it did not much matter what the cause was; the important question was the treatment. In the matter of treatment, his experience had shown him that it was much easier to expand a jaw than to contract one. He would certainly

treat this case by expanding the upper jaw and pushing its molars out to occlude with those of the lower jaw. That would hold the case in position. Having obtained that relationship, he would try to push out the upper incisors, particularly when the permanent teeth were erupting. He advised Mr. King to be quite sure that he got the upper incisors over the lower as they came down. He thought that there was every chance of the case proving a success if treated along these lines, and possibly also with a head-cap and chin-strap to keep the lower jaw back.

Mr. W. Ovey thanked Mr. King for reporting the case. It interested him because he had a daughter who at the age of 5 had developed an almost similar condition. The condition was hereditary, because the mother had manifested exactly the same anomaly. He had been able to apply a small wire for intermaxillary traction and to obtain a slight expansion at the top. (This had not been absolutely necessary, because the bite had been fairly normal.) The intermaxillary band had brought the lower jaw back perfectly, and the position had been maintained so that, when the permanent dentition erupted, the occlusion had been quite good. The speaker offered to exhibit the models on a subsequent occasion.

Mr. H. C. Visick asked whether Mr. King had found that children in whom this condition occurred tended to be mentally subnormal. In some investigations he himself had made with Dr. Livingston three years ago, he had found that the incidence of Class 3 dentition was much higher among subnormal children than among average children.

Mr. King replied that his patient was very much the reverse of subnormal.

Mr. Steadman said that he should hesitate very much to follow Mr. Levien's treatment if the case was one of protrusion of the mandible. His experience had been that the condition would recur time after time. If the upper incisors were trained over the lower at a certain age, the practitioner found that the mandible, after two or three years, had continued to grow and that the lower incisors were once more outside and in front. These were the worst class of cases to treat—if this was actually one of mandibular growth—and were best left alone.

Mr. Bocquet Bull thought that, if the photograph had been taken in profile, it would have shown that the case was not a Class 3 one at all. He was quite sure that Mr. Levien's treatment was the one to adopt and that if adopted it would have quite a satisfactory result.

Mr. Chapman agreed with Mr. Bocquet Bull. He said that the present condition might be due to the tongue being situated more in the lower jaw than in the upper; it would thus separate the lower incisors and not the upper. On the other hand, he also agreed with Mr. Steadman. In a case which he had had a short time before, in spite of the fact that the teeth had been trained to a normal position in two or three years, the lower jaw had persisted in growth and nothing but resection would be of any use.

Mr. H. G. Watkin said that he was surprised to hear Mr. Steadman take such a pessimistic view. He had seen two cases—boys aged 14 and 18—who he thought were entitled to a diagnosis of progressing forward growth of the mandible. He had not seen any younger cases. It was difficult, he said, to diagnose whether these cases were Class 1 or Class 3. The occlusion in all of them might be called prenormal or labial occlusion of the lower incisors; the molar occlusion must be practically Class 1. He did not know whether any means existed of diagnosing them. In practice he would not hesitate to expand the arch with a lingual arch, expanding all the teeth with a Badcock plate, which could be made in the form of a saddle with wires running round the back of the teeth, which could be simply pressed out. If this did not give satisfactory results, he would adopt Mr. Visick's suggestion, but he did not know whether this would be effective at the age of 4. He would be interested to know if Mr. Visick had had a case of that age where a chin-strap had brought a mandible back. Traction through the arch would certainly correct the condition. The fault was that the lower jaw was slightly too large and the upper slightly too small; when the incisors were corrected a little the lower spaces should be closed enough to prepare them for the upper dentition, and the space between the upper front teeth should be—increased to correct the upper dentition. The prognosis in such a case was very good.

Mr. S. B. Newton asked whether this case had started from the mal-apposition of the six-year-old molars. It would be interesting, he said, to know what state would be found if a radiograph were taken, say at 3 years of age. He had a case

in point of a child aged 12 who had complained of pain; X-rays had shown impaction of the erupting wisdom teeth. Was it not likely that some pressure might take place on a six-year-old molar?

Mr. KING, replying, thanked members for providing him with such a variety of lines of treatment. He had, in fact, already considered them all himself. The fundamental issue seemed to be whether the upper or lower dentition was at fault. Mr. Chapman's view was certainly the best: that each should share half the blame. He would adopt this half-way method, and perhaps with the help of Mr. Bocquet Bull's head-cap and chin-strap he might achieve good results.

He was pleased to see that every member who had discussed his case, with the exception of Mr. Steadman, had given him great hopes. He had twice attempted to take X-rays, but it was difficult to get the film low enough in the mandible in a child of that age. (Mr. King passed the films round for inspection.) He was sure that there was no impaction and that the six-year-old molars were erupting in a normal position.

PRESIDENT'S VALEDICTORY ADDRESS.

Ladies and Gentlemen,—In accordance with custom, and following in the footsteps of my forbears, I have now to address a few words to you, at the moment of descent from the high position which I, by your kindness, have had the honour to hold during the year which is past.

Whilst endeavouring to select a topic for this short swan-song, I have permitted my thoughts to range over the wide field in which the science of orthodontics may be said to be involved.

At the end of the twenty-second year of our existence, in possession of the fruits of the devoted labours of the Society's contributors during those two decades, we find ourselves, do we not, more than ever aware that the secrets of the etiology of malocclusion have yet to be yielded up.

If we take stock and seek to measure the extent of progress made hitherto, we find that careful research and intensive study have brought to light the enormous variety of the factors involved.

My sole object in making that so banal statement is to emphasise the necessity for the Society's continued vigorous existence. Sir Norman Bennett, in a recent speech, said that hereditary retrogression, or endocrine deficiency, were probably among the most important factors, and that the problem had not yet been solved, but he was convinced that it would be in time.

In those words lay great hope for the future, not only in the honour which will accrue to this or some other orthodontic society, but in the promise of oral health and facial beauty to generations yet unborn. Certain it is, that by the thorough investigation of the bearing upon oral deformity exerted by such influences as endocrine deficiency, want of adequate muscular activity, improperly balanced diet, vicious postural habits, incomplete use of the apparatus of respiration, insufficient oxygenation of the blood through lack of exercise and sunshine, the solution, though still far off, must assuredly be drawing nearer. May you and I be alive to see the day.

Mr. Pitts, I have very great pleasure in investing you with this badge of office. It is no secret to the Council, although it may be to the general body of members, that a year ago you were the senior Vice-President and I the next, and that at the Council's special request you consented to accept this office in 1931 and not, as was your due, in 1930.

The International Orthodontic Congress will meet in this city in 1931, and you unselfishly accepted the additional duties that will fall upon the President of the Society in this coming year; duties which I, living a distance from London, could not have performed adequately, if at all.

By virtue of distinguished service in many spheres, your name is known and honoured by all your colleagues. For many years we have been accustomed, both in Council and in general meeting, to hear from your lips words of profound wisdom, expressing in fluent speech that clarity of thought and deep learning that is yours. Be it the outcome of genius, or the result of an infinite capacity for taking pains, the Society well knows itself to have been the richer thereby, and hails your elevation to the presidential chair with acclamation, and I congratulate you.

Mr. A. T. Pitts was then inducted as President for the coming year, and invested with the badge of the presidential office.

Mr. Pitts: Ladies and Gentlemen,—Thank you very much. Like another Atlas, I shall endeavour to sustain this load on my shoulders.

Mr. Chapman moved a vote of thanks to the retiring President. He said: Sir, I am quite sure that you and the other members of the Society, as well as I myself, wish to offer our very deepest and grateful thanks to Mr. Marsh for the way in which he has presided over our sessions. While I have not all the knowledge which the Council possesses of the work which he has done, I know, and you know, from various events which have occurred during the year, that he has had much more business to attend to than has been apparent to our eyes. I therefore propose a very hearty vote of thanks to Mr. Marsh for his conduct of our proceedings in 1930.

Mr. V. A. F. Greenish seconded the vote of thanks.

Mr. Marsh, in reply, said: I am very grateful to you for according me this vote of thanks. My duty is now nearly over, but not quite, and the last office I have to perform gives me nearly as much pleasure as that of inducting Mr. Pitts into the chair. It is that of thanking my officers for the splendid way in which they have, literally, held me up. Mr. Packham has come to the end of nearly six years' devoted service as Honorary Secretary to this Society. I have only seen him at work during one year of it, and the very thought of that work makes me, if possible, more appalled than I am at present. Mr. Ovey has served you even longer still. Your other officers, the Honorary Curator and the Honorary Librarian, and your Editress, Mrs. Lindsay, leave no stone unturned in the interests of the Society. I must add a word of personal and very special thanks to the immediate Past-President, Mr. Northcroft, for his help and advice to me and to all the Council. I thank you, sir.

This vote of thanks was passed unanimously.

The new Chairman announced that the next meeting of the Society would be on the third Monday in January, the 19th, when he would have the honour of delivering his presidential address.

The meeting adjourned.